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Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) N.A.

89 ASTRONOMY 874
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS 876
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION 877
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS 877
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION 878
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

GENERAL

99 GENERAL 878

Note: N.A. means that no abstracts were assigned to this category for this issue.

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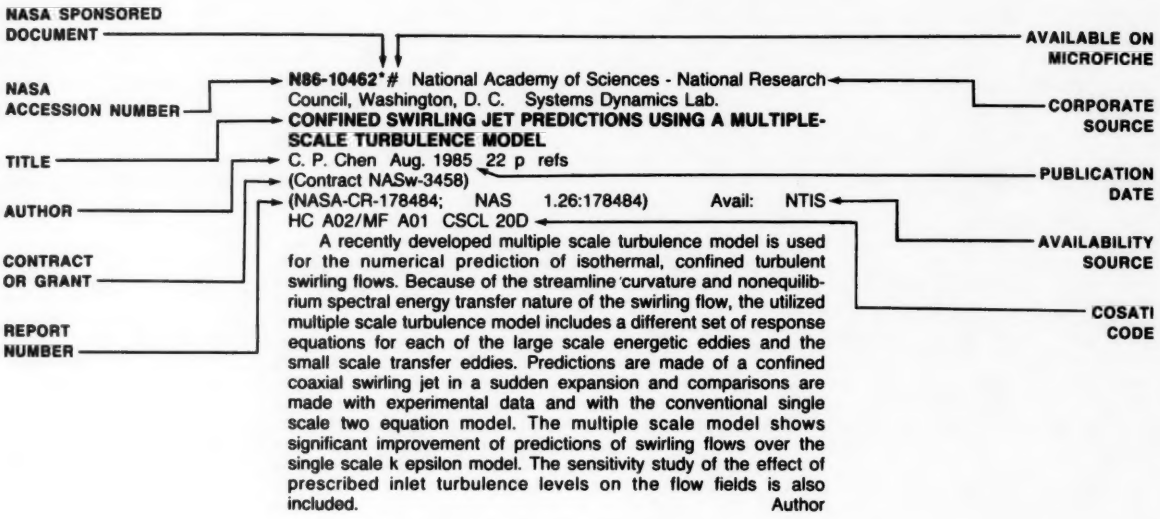
TYPICAL CITATION AND ABSTRACT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NASA ACCESSION NUMBER
N86-10462*# National Academy of Sciences - National Research Council, Washington, D. C. Systems Dynamics Lab.
CORPORATE SOURCE
TITLE
CONFINED SWIRLING JET PREDICTIONS USING A MULTIPLE-SCALE TURBULENCE MODEL
AUTHOR
C. P. Chen Aug. 1985 22 p refs
PUBLICATION DATE
CONTRACT OR GRANT
(Contract NASw-3458)
REPORT NUMBER
(NASA-CR-178484; NAS 1.26:178484) Avail: NTIS
AVAILABILITY SOURCE
HC A02/MF A01 CSCL 20D
COSATI CODE
A recently developed multiple scale turbulence model is used for the numerical prediction of isothermal, confined turbulent swirling flows. Because of the streamline curvature and nonequilibrium spectral energy transfer nature of the swirling flow, the utilized multiple scale turbulence model includes a different set of response equations for each of the large scale energetic eddies and the small scale transfer eddies. Predictions are made of a confined coaxial swirling jet in a sudden expansion and comparisons are made with experimental data and with the conventional single scale two equation model. The multiple scale model shows significant improvement of predictions of swirling flows over the single scale k epsilon model. The sensitivity study of the effect of prescribed inlet turbulence levels on the flow fields is also included.
Author

VOLUME 24 NUMBER 5 / MARCH 8, 1986

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N86-14214* National Aeronautics and Space Administration, Washington, D.C.
AERONAUTICAL ENGINEERING, A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 192)
Oct. 1985 173 p
(NASA-SP-7037(192); NAS 1.21:7037(192)) Avail: NTIS HC $6.00 CSCL 01A

This bibliography lists 626 reports, articles and other documents introduced into the NASA scientific and technical information system in September 1985. Author

N86-14215*# Ecosystems International, Inc., Crofton, Md.
NASA FLIGHT OPERATIONS REVIEW Final Report
Aug. 1985 153 p Sponsored by NASA
(NASA-CR-176404; NAS 1.26:176404) Avail: Issuing Activity CSCL 01B

This report is the fourth of a series of independent assessments of the provisions taken by NASA to assure the safety of their aviation operations. The particular review covered by this report concerns aviation operations conducted at the Kennedy Space Center (KSC). These reviews and independent assessments were undertaken as part of an on-going effort to provide NASA management with a qualitative evaluation of the overall organizational structure, administrative policy, and management provisions which dictate the manner in which NASA's aviation operations are conducted. This review was conducted by a group of unbiased aviation experts, selected for their familiarity and experience with aviation flight research and development activity. Recommendations for improvements are provided in this report whenever a significant impact on the present level of safety assurance was judged to be feasible. B.W.

N86-14216# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ACTA AERONAUTICA ET ASTRONAUTIC SINICA (SELECTED ARTICLES)
W. Ji, G. De, A. Sun, Y. Wu, and X. Yang 5 Aug. 1985 243 p Transl. into ENGLISH from Hangkong Xuebao (China), v. 5, no. 2, Jun. 1984 p 103-167, 178-192, 200-247
(AD-A158454; FTD-ID(RS)T-1515-84) Avail: NTIS HC A11/MF A01 CSCL 01/3

Among the topics discussed in this report are the following: aeroelastic research; scene matching and its application to aerospace electron systems; a kernel function method for computing unsteady load on three-dimensional wings in transonic flow; root locus method and automatic identification of modes in flutter analysis; determination of axis and angle of rotation of retractable landing gear; delta function and generalized tables of thermodynamic properties of combustion products of C sub n H sub m - air system; multi-rate digital flight control system; reconfigurable redundancy management strategy for a triplex DFBW system; an equivalent strength method for optimum design of composite laminates. GRA

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N86-14217# National Aerospace Lab., Tokyo (Japan).
GRID GENERATION FOR SINGLE AIRFOIL USING CONFORMAL MAPPING
Feb. 1985 6 p refs
(NAL-TR-8511; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

A method to generate girds for numerical computation for an arbitrary single airfoil section using conformal mapping is presented in this paper. The function which maps conformally the region exterior to the airfoil section onto the exterior of the unit circle is determined by the method developed by Moriya and Imai. O,h-and C-type grids are generated with the mapping function. Author

N86-14218*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THEORETICAL AND EXPERIMENTAL FLOW FIELDS FOR A SUPERSONIC CRUISE FIGHTER FOREBODY
Steven F. Yaros Nov. 1985 43 p refs
(NASA-TM-86450; L-15914; NAS 1.15:86450) Avail: NTIS HC A03/MF A01 CSCL 01A

The capability of two numerical methods to predict the flow field about a representative supersonic cruise aircraft was examined. The two codes were a small-disturbance transonic program of Boppe and a conservative form full-potential transonic program of Shankar and Szema. For the former code, comparisons were made with wind-tunnel data at Mach numbers of 0.6, 0.9, and 1.2 and angles of attack of 0 deg, 5 deg, and 10 deg (7.5 deg instead of 10 deg at a Mach number of 1.2). Predictions from the two codes were compared at a Mach number of 1.2 and an angle of attack of 7.5 deg. The comparison criteria were contours of local angle of attack, local angle of sideslip, and local Mach number. The comparisons indicated that both codes may be considered useful for design applications, depending on the degree of accuracy required by the user's solution. Both solutions show an inaccuracy in their predictions, particularly as Mach number and/or angle of attack increases, because of their lack of viscous effects and any mechanisms to predict vortex development. Author

N86-14219*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SEMIEMPIRICAL METHOD OF DETERMINING FLOW COEFFICIENTS FOR PITOT RAKE MASS FLOW RATE MEASUREMENTS

Charles J. Trefny Nov. 1985 17 p refs
(NASA-TM-87144; E-2772; NAS 1.15:87144) Avail: NTIS HC A02/MF A01 CSCL 01A

Flow coefficients applicable to area-weighted pitot rake mass flow rate measurements are presented for fully developed, turbulent flow in an annulus. A turbulent velocity profile is generated semiempirically for a given annulus hub-to-tip radius ratio and integrated numerically to determine the ideal mass flow rate. The calculated velocities at each probe location are then summed, and the flow rate as indicated by the rake is obtained. The flow coefficient to be used with the particular rake geometry is subsequently obtained by dividing the ideal flow rate by the rake-indicated flow rate. Flow coefficients ranged from 0.903 for one probe placed at a radius dividing two equal areas to 0.984 for a 10-probe area-weighted rake. Flow coefficients were not a strong function of annulus hub-to-tip radius ratio for rakes with three or more probes. The semiempirical method used to generate the turbulent velocity profiles is described in detail. Author

N86-14220*# DEI-Tech, Inc., Newport News, Va.
AN AIRFOIL FLUTTER MODEL SUSPENSION SYSTEM TO ACCOMMODATE LARGE STATIC TRANSONIC AIRLOADS Final Report
Wilmer H. Reed, III Oct. 1985 39 p refs
(Contract NAS1-17686)
(NASA-CR-177998; NAS 1.26:177998; D-8402-3) Avail: NTIS HC A03/MF A01 CSCL 01A

A pitch/plunge flutter model suspension system and associated two-dimensional MBB-A3 airfoil models is described. The system is designed for installation in the Langley 6-by-19-inch and 6-by-18-inch transonic blowdown wind tunnels to enable systematic study of the transonic flutter characteristics and static pressure distributions of supercritical airfoils at transonic Mach numbers. A compound spring suspension concept is introduced which simultaneously meets requirements for low plunge-mode stiffness, lightweight suspended model, and large steady lift due to angle of attack without the need for excessive static deflections of the plunge spring. The system features variable pitch and plunge frequencies, changeable airfoil rotation axes, and a self aligning control system to maintain a constant mean position of the model with changing airload. Author

N86-14221*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A FOURTH-ORDER SCHEME FOR THE UNSTEADY COMPRESSIBLE NAVIER-STOKES EQUATIONS Final Report
A. Bayliss, P. Parikh, L. Maestrello, and E. Turkel Oct. 1985 26 p refs Submitted for publication
(Contracts NAS1-17070; NAS1-17130)
(NASA-CR-177994; ICASE-85-44; NAS 1.26:177994) Avail: NTIS HC A03/MF A01 CSCL 01A

A computational scheme is described which is second-order accurate in time and fourth-order accurate in space (2-4). This method is applied to study the stability of compressible boundary layers. The laminar compressible Navier-Stokes equations are solved with a time harmonic inflow superimposed on the steady state solution. This results in spatially unstable modes. It is shown that the second-order methods are inefficient for calculating the growth rates and phases of the unstable modes. In contrast the fourth-order method yields accurate results on relatively course meshes. Author

N86-14222*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SEMIEMPIRICAL METHOD FOR PREDICTING VORTEX-INDUCED ROLLING MOMENTS
Dennis O. Allison and Percy J. Bobbitt Nov. 1985 19 p refs
(NASA-TM-87579; L-15986; NAS 1.15:87579) Avail: NTIS HC A02/MF A01 CSCL 01A

A method is described for the prediction of rolling moments on a wing penetrating a vortex velocity field generated by a large aircraft. Rolling moments are determined from lifting pressure coefficients computed with an inviscid-flow linear panel method. Two empirical corrections are included to account for the lifting efficiency of an airfoil section and the local stall on the wing. Predicted rolling moments are compared with those from two windtunnel experiments. Results indicate that experimental rolling moments, for which the Reynolds number of the following wing is low, should be interpreted with caution. Author

N86-14223*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
VELOCITY AND TEMPERATURE DECAY CHARACTERISTICS OF INVERTED-PROFILE JETS
U. vonGlahn, J. Goddykoontz, and C. Wasserbauer [1985] 32 p refs To be presented at the 24th Aerospace Sciences Meeting, Reno, Nevada, 6-9 January 1986; sponsored by American Inst. of Aeronautics and Astronautics
(NASA-TM-87159; E-2681; NAS 1.15:87159; AIAA-86-0312) Avail: NTIS HC A03/MF A01 CSCL 01A

In order to design efficient, lightweight flap systems for future engine under-the-wing STOL aircraft, the velocity and temperature decay rate of the jet plume must be increased relative to that for single-stream nozzles in order to provide local flap loads and structural temperatures within acceptable limits. The jet plume decay rate of dual flow engines can be increased by resorting to inverted-profile velocity and temperature nozzle concepts. The peak axial decay characteristics of model-scale, two-stream inverted-profile nozzle flows are empirically correlated. Also discussed are the radial and spreading characteristics of inverted-profile nozzle flows. Author

N86-14224*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A MODEL FOR CLOSING THE INVISCID FORM OF THE AVERAGE-PASSAGE EQUATION SYSTEM
John J. Adamczyk, Richard A. Mulac (Sverdrup Technology, Inc., Middleburg Heights, Ohio), and Mark L. Celestina (Sverdrup Technology, Inc., Middleburg Heights, Ohio) [1985] 15 p refs To be presented at the 31st International Gas Turbine Conference, Dusseldorf, West Germany, 8-12 June 1986; sponsored by the American Society of Mechanical Engineers
(NASA-TM-87199; E-2854; NAS 1.15:87199) Avail: NTIS HC A02/MF A01 CSCL 01A

A mathematical model is proposed for closing or mathematically completing the system of equations which describes the time average flow field through the blade passages of multistage turbomachinery. These equations referred to as the average passage equation system govern a conceptual model which has proven useful in turbomachinery aerodynamic design and analysis. The closure model is developed so as to insure a consistency between these equations and the axisymmetric through flow equations. The closure model was incorporated into a computer code for use in simulating the flow field about a high speed counter rotating propeller and a high speed fan stage. Results from these simulations are presented. Author

N86-14225# Deutsche Gesellscaft fuer Luft und Raumfahrt, Bonn (West Germany).
THE STATE OF DEVELOPMENT RESEARCH IN NUMERICAL AERODYNAMICS IN WEST GERMANY [NUMERISCHE AERODYNAMIK - STAND DER ENTWICKLUNG IN DEUTSCHLAND]
1984 175 p refs Partly in GERMAN and ENGLISH Symp. held at Neubiberg, West Germany, 2-3 Jul. 1984
(DGLR-84-01; ISBN-3-922010-25-3) Avail: NTIS HC A08/MF A01

Among the topics discussed at the Symposium in Neubiberg 2 to 3 July 1984 on the status of Research in Numnerical Aerodynamics in West Germany were the following: Solutions of the Navier-Stokes equations; the Euler equations; and of the full potential equations. For individual titles, see N00-00001 through N00-00024. For individual titles, see N86-14226 through N86-14249.

N86-14226# Deutsche Gesellscaft fuer Luft und Raumfahrt, Bonn (West Germany).

SUMMARY REPORT ON THE WORKING GROUP FOR CONFERENCE 1: SOLUTIONS OF THE NAVIER-STOKES EQUATIONS [ZUSAMMENFASSENDER BERICHT DER ARBEITSGRUPPE ZUR SITZUNG 1. LOESUNGEN DER NAVIER-STOKES'SCHEN GLEICHUNGEN]

D. Haenel, W. Haase, W. Kordulla, and D. Schwamborn *In its* The State of Development Research in Numerical Aerodynamics in West Germany 1984 p 5-7 In GERMAN (For primary document see N86-14225 05-02)

Avail: NTIS HC A08/MF A01

Applications of numerical procedures for solution of the Euler equations to three dimension studies, to the production of body-adapted grids, to the construction of block-structured differential grids, to the formulation of the boundary transition conditions, and to the determination of aerodynamic factors are discussed. Application of a finite volume method to the formulation and discretization of the conservation equations; and application of the Navier-Stokes solutions in two dimensions to the study of numerical aerodynamics using supercomputers of the CRAY 1S type are considered. Investigations of separated flow and vorticity are reviewed. Further investigation of the Navier-Stokes equations are recommended to develop physical model representations on transition and turbulence and to study their applicability to 3-D configurations. Author (ESA)

N86-14227# Deutsche Gesellscaft fuer Luft und Raumfahrt, Bonn (West Germany).

SUMMARY REPORT ON THE WORKING GROUP ON CONFERENCE 2: SOLUTIONS OF THE EULER EQUATIONS [ZUSAMMENFASSENDER BERICHT DER ARBEITSGRUPPE ZUR SITZUNG 2. LOESUNGEN DER EULER-GLEICHUNGEN]

A. Das, A. Eberle, J. Grashof, and W. Schmidt *In its* The State of Development Research in Numerical Aerodynamics in West Germany 1984 p 8-10 In GERMAN (For primary document see N86-14225 05-02)

Avail: NTIS HC A08/MF A01

Comparison of the Euler equations and the potential theory for supersonic flows; solutions in full potential theory in approximation steps for total pressure loss study and for trailing edge study; application of dynamic adaptative grids in the solution of 1-D hyperbolic equations; and solution of the time-dependent Euler equations are discussed. Author (ESA)

N86-14228# Deutsche Gesellscaft fuer Luft und Raumfahrt, Bonn (West Germany).

SUMMARY REPORT ON THE WORKING GROUP FOR CONFERENCE 3: SOLUTIONS OF THE FULL POTENTIAL EQUATIONS [ZUSAMMENFASSENDER BERICHT DER ARBEITSGRUPPE ZUR SITZUNG 3. LOESUNGEN DER VOLLSTAENDIGEN POTENTIAL-GLEICHUNG] c34

E. H. Hirschel, K. D. Klevenhusen, S. Leicher, and H. Sobieczky *In its* The State of Development Research in Numerical Aerodynamics in West Germany 1984 p 11-13 In GERMAN (For primary document see N86-14225 05-02)

Avail: NTIS HC A08/MF A01

Application of potential theory to complicated 3-D configurations for construction of computational grids; accelerated assessment using the multigrid method and accurate calculation of the compression shocks using the solutions of the Euler equations; and modification of potential theory for entropy and resistance study and for finer representation of shock discontinuity are discussed. Algorithm acceleration and economical design of optimal aerodynamic configurations completed with wind tunnel tests are described. The potential method is improved to calculate the external inviscid flow distribution using the Navier-Stokes equations. Viscosity effects are also studied. Author (ESA)

N86-14229# Technische Hochschule, Darmstadt (West Germany). Fachbereich Mathematik.

AN IMPLICIT FINITE-DIFFERENCE PROCEDURE FOR THE NUMERICAL SOLUTION OF UNSTEADY SUPERSONIC FLOW OVER A BLUNT BODY

M. S. Abouel-Seoud *In* DGLR The State of Development Research in Numerical Aerodynamics in West Germany 1984 p 14-19 refs (For primary document see N86-14225 05-02)

Avail: NTIS HC A08/MF A01

An axisymmetric supersonic viscous flow over a blunt body is simulated with solution of the unsteady Navier-Stokes equations with thin layer approximation. The numerical algorithm used to solve the conservation law form for the thin layer Navier-Stokes equations for time-dependent compressible flow is based on an implicit iterative scheme. The convergence of the numerical algorithm and the stability of the corresponding nonlinear system of equations are ensured by selected discretization parameters and dissipative coefficients. Author (ESA)

N86-14230# Karlsruhe Univ. (West Germany). Inst. fuer Hydromechanik.

A NUMERICAL PROCEDURE TO SOLVE NAVIER-STOKES EQUATIONS AT THE INSTITUTE OF HYDROMECHANICS, KARLSRUHE UNIVERSITY [NUMERISCHE VERFAHREN ZUR LOESUNG DER NAVIER-STOKES-GLEICHUNGEN AM INSTITUT FUER HYDROMECHANIK DER UNIVERSITAET KARLSRUHE] c34

B. Schoenung, A. O. Demuren, S. Majumdar, and W. Rodi *In* DGLR The State of Development Research in Numerical Aerodynamics in West Germany 1984 p 20-26 refs In GERMAN (For primary document see N86-14225 05-02)

Avail: NTIS HC A08/MF A01

An extended version of the numerical procedure used to calculate 2-D elliptic problems based on the TEACH computer program including checkered grids and a hybrid central upstream differencing scheme is applied to 3-D flow problems. Complete and partial parabolic versions are developed to allow economical calculation of nonseparated flows to be performed. Investigations are made to extend these 3-D procedures for curvilinear body-adapted coordinates. Author (ESA)

N86-14231# Technische Hochschule, Aachen (West Germany). Inst. fuer Aerodynamik.

SOLUTIONS OF THE NAVIER-STOKES EQUATIONS FOR VORTICAL FLOW [LOESUNGEN DER NAVIER-STOKES GLEICHUNGEN FUER WIRBELBEHAFTETE STROEMUNGEN]

D. Haenel *In* DGLR The State of Development Research in Numerical Aerodynamics in West Germany 1984 p 27-28 refs In GERMAN (For primary document see N86-14225 05-02)

Avail: NTIS HC A08/MF A01

Investigations of flows with vortices are reviewed. Incompressible flow (calculation of the leading edge vortex on delta wings) and compressible flow (solutions of the Navier-Stokes equations using implicit factorization and using the multigrid method) are discussed. Author (ESA)

N86-14232# Technische Hochschule, Aachen (West Germany).

NUMERICAL CALCULATION OF LEADING-EDGE VORTICES ON A FLAT DELTA WING Thesis

P. M. Hartwich *In* DGLR The State of Development Research in Numerical Aerodynamics in West Germany 1984 p 29-43 In GERMAN (For primary document see N86-14225 05-02)

Avail: NTIS HC A08/MF A01

Finite difference solutions of the Navier-Stokes and Euler equations were applied to study a 3-D incompressible flow over a flat wing using an artificial compressibility. The results for viscous and inviscid flows were compared. The truncation errors near the leading edge resulting in numerical dissipation and vorticity in Euler solution are studied with a 2-D inviscid flow over a vertical plate. Numerical simulations are made to study the breakdown of an isolated vortex, the flow over a 2-D car model and the viscous flow over a backward facing step. Vortex stability and bubble structure are studied. Author (ESA)

N86-14233# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Inst. fuer Theoretische Stroemungsmechanik.

SIMULATION OF THREE-DIMENSIONAL VISCOUS TRANSONIC FLOWS [SIMULATION REIBUNGSBEHAFTETER 3-D TRANS-

SONISCHET STROEMUNGEN]
W. Kordulla *In* DGLR The State of Development Research in Numerical Aerodynamics in West Germany 1984 p 44-48 refs In GERMAN (For primary document see N86-14225 05-02)
Avail: NTIS HC A08/MF A01

Viscous transonic flows over a semiconical-cylindrical configuration are simulated on a CRAY 1S supercomputer using a modified version of the explicit implicit McCormack method based on the finite volume method and using the level concept for measuring the pressure distribution to study the asymptotic behavior of the flow on body surfaces. Measures of the pressure distributions are discussed for angles of attack ranging from 0 to 19 deg. Flow vorticity and asymptotic wall flow line direction are studied using an improved mesh grid. The calculations allow the determination of the forces resulting from a flow over a body to be performed. The integration method is applied to simulate the flow around a body. Author (ESA)

N86-14234# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Inst. fuer Theoretische Stroemungsmechanik.
CALCULATION OF AXISYMMETRIC LAMINAR SUPERSONIC FLOWS OVER BLUNT BODIES [BERECHNUNG ACHSENSYMMETRISCHER LAMINARER UEBERSCHALLSTROEMUNGEN UM STUMPFE KOERPER]
Bernhard Mueller *In* DGLR The State of Development Research in Numerical Aerodynamics in West Germany 1984 p 49-53 refs In GERMAN (For primary document see N86-14225 05-02)
Avail: NTIS HC A08/MF A01

The implicit Beam and Warming difference procedure is applied to solve the axisymmetric Euler and Navier-Stokes equations in thin layer approximation used to study the effects of viscosity in supersonic flow over blunt bodies at high Reynolds numbers. A numerical program is developed and its economical application regarding time saving and calculation speed is tested by calculating the laminar flows over a semispherical cylindrical configuration and over a spherical blunt cone with adiabatic and isothermal walls at Mach numbers from 12 to 20.3. The theoretical results show good agreement with experiments. The numerical simulation allows the prediction of the separation point. The validity of the thin layer approximation for flows with large separation area is demonstrated by comparing the thin layer equations with the full Navier-Stokes equations for supersonic flow over a blunt body of revolution. Author (ESA)

N86-14235# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Inst. fuer Theoretische Stroemungesmechanik.
SOLUTIONS OF THE NAVIER-STOKES EQUATIONS WITH THE FINITE VOLUME METHOD [NAVIER-STOKES LOESUNGEN MIT FINITEN VOLUMEN VERFAHREN]
D. Schwamborn and E. Katzer *In* DGLR The State of Development Research in Numerical Aerodynamics in West Germany 1984 p 54-60 refs In GERMAN (For primary document see N86-14225 05-02)
Avail: NTIS HC A08/MF A01

The effects of friction and separation on flow distribution are calculated with three dimensional boundary methods to develop a modular program system for solution of the Navier-Stokes and Euler equations for profiles, wings, and blunt bodies and for investigation of impact-boundary layer interaction on plate and profile, of the flow over a semicylinder on a plate, of boundary layer - pressure wave interaction, and wake flows. The effects of the grids and the synthetic dissipation on the solution are studied and turbulent model modules are tested to simulate turbulent flows. The solutions are verified with comparative calculations. Tests are performed with Poiseuille flow, Couette flow, and the boundary layer on a plane plate. The development of simple models of the impact-boundary layer interaction is based on the relation between the separation bubble length and Mach and Reynolds numbers and the impact force. Author (ESA)

N86-14236# Stuttgart Univ. (West Germany). Inst. fuer Raumfahrtantriebe.
A NAVIER-STOKES PROCEDURE FOR SIMULATION OF TWO-DIMENSIONAL AND QUASI TWO-DIMENSIONAL GRID FLOWS [EIN NAVIER-STOKES VERFAHREN ZUR SIMULATION ZWEIDIMENSIONALER UND QUASI-ZWEIDIMENSIONALER GITTERSTROEMUNGEN]
O. Schaefer *In* DGLR The State of Development Research in Numerical Aerodynamics in West Germany 1984 p 61-71 ref In GERMAN (For primary document see N86-14225 05-02)
Avail: NTIS HC A08/MF A01

A Navier-Stokes procedure for simulation of a flow through straight blade grids is improved. A quasi 2-D formulation of the equations account for the effects of nonparallel lateral walls. A more accurate spatial discretization around singular points is achieved. Overlapping calculation meshes in periodical areas and a more accurate introduction of the periodicity condition; a total implicit boundary condition for C-meshes as well as specific finite volume operators for singular points are described. Author (ESA)

N86-14237# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).
THERMOFLUIDYNAMIC CALCULATION OF THE PLANE FLOW DISTRIBUTION OF A SECONDARY INJECTION [THERMOFLUIDDYNAMISCHE BERECHNUNG DES EBENEN STROEMUNGSFELDES EINER SEKUNDAER-INJEKTION] c34
H. Schneider *In* DGLR The State of Development Research in Numerical Aerodynamics in West Germany 1984 p 72-73 In GERMAN (For primary document see N86-14225 05-02)
Avail: NTIS HC A08/MF a01

A numerical procedure is developed to calculate the fluid dynamic forces in a secondary injection using the PHOENICS program to solve the Navier-Stokes equations completed by a mass conservation equation for chemical components and an extended energy equation. Transverse injections of H2-jet and of cold air injection into a hot air flow are limited to the study of plane flow fields in a system of Cartesian coordinates. The velocity distributions, pressure, and temperature profiles are calculated as well as oxidizer concentration and fuel and combustion products. Shear force is little influenced by viscosity.
Author (ESA)

N86-14238# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
PROCEDURE FOR SOLUTION OF THE NAVIER-STOKES EQUATIONS AT DORNIER GmbH [LOESUNGSVERFAHREN FUER DIE NAVIER-STOKES-GLEICHUNGEN BEI DER FIRMA DORNIER]
W. Haase *In* DGLR The State of Development Research in Numerical Aerodynamics in West Germany 1984 p 74-77 refs In GERMAN (For primary document see N86-14225 05-02)
Avail: NTIS HC A08/MF A01

Simulations using the solutions of the Navier-Stokes equations are studied. Flow over profiles using the solution adaptive grid method; cascade flow using the McCormack scheme; shock-boundary layer interaction using the McCormack scheme and the Runge-Kutta time-stepping scheme; flow over afterbodies using the McCormack scheme; flow over car models using the block-structured grid method; and engine internal flow are considered.
Author (ESA)

N86-14239# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany). Unternehmensgruppe Hubschrauber und Flugzeuge.
COMPARISON OF THE EULER AND POTENTIAL SOLUTIONS FOR SUPERSONIC FLOWS OVER DELTA WINGS [VERGLEICH VON EULER- UND POTENTIALLLOESUNGEN FUER UEBERSCHALLSTROEMUNGEN AN DELTAFLUEGELN]
C. Weiland *In* DGLR The State of Development Research in Numerical Aerodynamics in West Germany 1984 p 78-85 refs In GERMAN (For primary document see N86-14225 05-02)
Avail: NTIS HC A08/MF A01

Supersonic flows over delta wings are studied using the Euler

procedure associated with the shock fitting method to determine the head shock wave and using the potential procedure with the shock capturing method to determine the position and force of the head shock wave. The flow distribution can be economically described with the potential procedure and not with the Euler procedure. The entropy rises due to compression shocks along the flow lines and the entropy gradients due to the compression shock curvature can be explained with the Euler equations. The results of the Euler solution for a delta wing were compared with those of the potential solution using photographs. Further investigations are recommended to study the influence of the elimination of entropy variations on the solutions. Author (ESA)

N86-14240# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany). Unternehmensgruppe Hubschrauber und Flugzeuge.

TRAILING EDGE FLOW WITH TRANSONIC PROFILES [ZUR HINTERKANTENSTROEMUNG BEI TRANSSONISCHEN PROFILEN]

E. H. Hirschel and C. W. Lucchi *In* DGLR The State of Development Research in Numerical Aerodynamics in West Germany 1984 p 86-92 ref In GERMAN (For primary document see N86-14225 05-02)

Avail: NTIS HC A08/MF A01

The trailing edge in subcritical and supercritical flows is studied regarding pressure, velocity and friction effects to determine the relation between the Kutta angle in inviscid flow and the profile curvature due to compression shock on the suction side of the airfoil profile. The Euler procedure is used to determine the correlation between the numerical results. The vorticity in supercritical flow is studied with solutions of potential theory and cinematically. Results show that profile curvature is due to pressure loss at rest, nonuniqueness of the numerical methods for the trailing edge, and possible relaxation of the potential method. Author (ESA)

N86-14241# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany). Theoretical Aerodynamics Div.

A NEW EULER ALGORITHM BASED ON CHARACTERISTIC FLUX EXTRAPOLATION

Albrecht Eberle *In* DGLR The State of Development Research in Numerical Aerodynamics in West Germany 1984 p 93-100 (For primary document see N86-14225 05-02)

Avail: NTIS HC A08/MF A01

An asymmetric weighting procedure based on the eigenvalue decomposition of the Euler equations is developed for flow variables at cell faces to calculate flux extrapolation. Left and right states are defined by linear combinations of the flow quantities of the two adjacent cells on each side of a volume cell face. They are weighted with elements of the split matrix to obtain the averaged flow values and the Euler fluxes. Cell midpoint values are updated with the centered difference operator applied on the fluxes. The scheme is accurate in space and time in the pseudo-unsteady option and is entropy-conditioned. Author (ESA)

N86-14242# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany). Abt. Theoretische Aerodynamik.

PROCEDURE FOR SOLUTION OF THE EULER EQUATIONS AT DORNIER GmbH [LOESUNGSVERFAHREN FUER DIE EULER-GLEICHUNGEN BEI DER FIRMA DORNIER]

Joachim Grashof *In* DGLR The State of Development Research in Numerical Aerodynamics in West Germany 1984 p 101-104 In GERMAN (For primary document see N86-14225 05-02)

Avail: NTIS HC A08/MF A01

A solution procedure of the Euler equations is developed for prediction of the flows on aircraft and aircraft components for aerodynamic design. Its applications and versions are listed according to the grid structure. The numerical accuracy of the Euler calculations is demonstrated with 2-D flow numerical examples taking into account the comparison of the Euler solution with the potential solution in subsonic flow, total pressure analysis, the influence of the grids on the results, and convergence acceleration. Numerical examples in 2-D and 3-D flows are presented as well as the results of the numerical simulation of the leading edge vorticity. Author (ESA)

N86-14243# Gesellschaft fuer Reaktorsicherheit, Garching (West Germany).

APPLICATION OF A DYNAMIC GRID ADAPTATION IN THE ASWR PROCEDURE [VERWENDUNG EINER DYNAMISCHEN GITTERANPASSUNG IM ASWR-VERFAHREN]

U. Graf, P. Romstedt, and W. Werner *In* DGLR The State of Development Research in Numerical Aerodynamics in West Germany 1984 p 105-111 refs In GERMAN (For primary document see N86-14225 05-02)

Avail: NTIS HC A08/MF A01

A dynamic grid adaptation method is developed for the ASWR procedure to determine automatically the spatial grid with the solution of hyperbolic or parabolic vector partial difference equations. The grid adaptation algorithm is based on a minimization of the L2-standard of the spatial discretization error. Accurate calculation of the solutions with inhomogeneity or transitions on a coarse grid is performed with a reduced number of grid points using the method. The calculation is based on fixed equidistant Euler grids with reduced calculation time. Author (ESA)

N86-14244# Gesellschaft fuer Mathematik und Datenverarbeitung, St. Augustin (West Germany).

DEVELOPMENT OF MULTIGRID ALGORITHMS FOR PROBLEMS FROM FLUID DYNAMICS c34

Klaus Becker and Ulrich Trottenberg *In* DGLR The State of Development Research in Numerical Aerodynamics in West Germany 1984 p 112-120 refs In GERMAN (For primary document see N86-14225 05-02)

Avail: NTIS HC A08/MF A01

Multigrid algorithms are developed to demonstrate multigrid technique efficiency for complicated fluid dynamics problems regarding error reduction and discretization accuracy. Subsonic potential 2-D flow around a profile is studied as well as rotation-symmetric flow in a slot between two rotating spheres and the flow in the combustion chamber of Otto engines. The study of the 2-D subsonic potential flow around a profile with the multigrid algorithm is discussed. Author (ESA)

N86-14245# Messerschmitt-Boelkow-Blohm G.m.b.H., Bremen (West Germany).

CONTRIBUTION TO THE POTENTIAL CALCULATION OF ANISOTROPIC COMPRESSION SHOCKS IN A PLANE CASE [BEITRAG ZUR POTENTIALTHEORETISCHEN BERECHNUNG NICHTISENTROPER VERDICHTUNGSSTOESSE IM EBENEN FALL]

K.-D. Klevenhusen *In* DGLR The State of Development Research in Numerical Aerodynamics in West Germany 1984 p 121-126 refs In GERMAN (For primary document see N86-14225 05-02)

Avail: NTIS HC A08/MF A01

Anisotropic compression shocks are produced based on the potential theory with a swelling flow from the impact location and a determined swelling force for a perpendicular impact, to study the lift on a profile and get a more accurate physical description of a real flow. Impact location shows good agreement with the Euler solutions. The entropy rise due to the impact can be calculated from conservation laws. Author (ESA)

N86-14246# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany). Unternehmensgruppe Hubschrauber und Flugzeuge.

A PROCEDURE FOR SOLUTION OF FULL POTENTIAL EQUATIONS WITH CORRECTION OF THE TRAILING EDGE CONDITION [EIN VERFAHREN ZUR LOESUNG DER VOLLSTAENDIGEN POTENTIAL-GLEICHUNG MIT KORREKTUR DER HINTERKANTENBEDINGUNG]

Ciro W. Lucchi *In* DGLR The State of Development Research in Numerical Aerodynamics in West Germany 1984 p 127-131 refs In GERMAN (For primary document see N86-14225 05-02)

Avail: NTIS HC A08/MF A01

A procedure to reduce the differences between the calculated

static pressure distributions on profiles and the exact solutions of the Euler equations in the use of conservative potential methods for 2-D transonic flows over profiles is developed. The procedure contains the correction of the static pressure distribution points on and behind the impact on a profile and a form of the Kutta-Jouskowski condition with the Neumann boundary conditions on the profile trailing edge slot. Accuracy is demonstrated with a conservative subdomain finite element method for full potential equations. The results with profiles with or without lift are presented. Author (ESA)

N86-14247# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany).
SHOCK DESIGN FOR REFINED RECALCULATIONS [STOSSENTWURF ALS GRUNDLAGE VERFEINERTER NACHRECHNUNGEN]
H. Sobieczky *In* DGLR The State of Development Research in Numerical Aerodynamics in West Germany 1984 p 132-133 ref In GERMAN (For primary document see N86-14225 05-02)
Avail: NTIS HC A08/MF A01

The fictive gas method for design of shock free transonic configurations based on the formulation of the boundary problems of transonic differential equations is extended to compression shock using the boundary lines for shock formation to explain a supersonic collision flow over a 2-D profile. The method enables the resulting form to coincide with a given form with a supposed accuracy. A recalculation procedure is applied to study the accuracy of the Euler equations with entropy corrections. Author (ESA)

N86-14248# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Entwurfsaerodynamik.
REVIEW OF RESEARCH IN NUMERICAL AERODYNAMICS AT THE DFVLR IN BRUNSWICK [UEBERLICK UEBER DIE NUMERISCHE AERODYNAMIK IN DER DFVLR, BRAUNSCHWEIG]
N. Kroll and A. Das *In* DGLR The State of Development Research in Numerical Aerodynamics in West Germany 1984 p 134-168 refs In GERMAN (For primary document see N86-14225 05-02)
Avail: NTIS HC A08/MF A01

Numerical methods used for fluid mechanics and acoustics investigations are reviewed. Mesh generation with algebraic equations and partial differential equations; solution of the Euler equations for calculation of the flows over profiles; solution of the potential equations for calculation of the flow over profiles and airfoils; and solution of the 2-D incompressible Navier-Stokes equations in body-adapted coordinates are summarized.
Author (ESA)

N86-14249# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
PROCEDURE FOR SOLUTION OF THE FULL POTENTIAL EQUATION AT DORNIER GmbH [LOESUNGSVERFAHREN FUER DIE VOLLSTAENDIGE POTENTIALGLEICHUNG BEI DER FIRMA DORNIER]
S. Leicher *In* DGLR The State of Development Research in Numerical Aerodynamics in West Germany 1984 p 169-171 In GERMAN (For primary document see N86-14225 05-02)
Avail: NTIS HC A08/MF A01

Numerical procedures for economical solution of the full potential equation for 2-D profiles (systems and optimization) and for 3-D wing and body-wing configurations are reviewed. Further investigations of their coupling with boundary layer methods are recommended. Author (ESA)

N86-14250*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
FLEXWAL: A COMPUTER PROGRAM FOR PREDICTING THE WALL MODIFICATIONS FOR TWO-DIMENSIONAL, SOLID, ADAPTIVE-WALL TUNNELS
Joel L. Everhart Nov. 1983 53 p
(NASA-TM-84648; NAS 1.15:84648) Avail: NTIS HC A04/MF A01 CSCL 01A

A program called FLEXWAL for calculating wall modifications for solid, adaptive-wall wind tunnels is presented. The method used is the iterative technique of NASA TP-2081 and is applicable to subsonic and transonic test conditions. The program usage, program listing, and a sample case are given. Author

N86-14251# Naval Surface Weapons Center, Silver Spring, Md.
ALTERNATE ALTITUDE TESTING OF SOLID CLOTH PARACHUTE SYSTEMS Final Report
W. P. Ludtke 10 Oct. 1985 85 p
(AD-A157068; NSWC/TR-85-24) Avail: NTIS HC A05/MF A01 CSCL 01/3

The flight testing of solid cloth parachutes sometimes calls for unique test conditions such as very high altitudes for extremely low dynamic pressures, or heavy payloads, such as cargo tested at low attitudes. Each of these conditions may require exceptional test equipment and/or facilities such as balloon-borne and rocket-assisted high-altitude vehicles or large cargo aircraft for low altitude heavy payloads. These requirements can add significantly to the overall test program cost and complexity. In order to reduce development test costs and complexity, a theoretical study was conducted to determine the possibility of altering the test conditions in a manner which would permit the use of lower cost test assets and still obtain same parachute opening shock forces and stress distributions. The results show that if the system mass and test velocity are varied, as shown in the accompanying method for a constant Ballistic Mass Ratio (BMR) scale parameter, the opening shock force and stress distributions are constant for all altitudes. A technique is described which theoretically permits parachute systems to be tested under more convenient conditions of altitude, velocity, and system mass resulting in the same conditions of opening shock force and parachute stress distribution. GRA

N86-14252# Nielsen Engineering and Research, Inc., Mountain View, Calif.
HIGH MACH NUMBER PREDICTIVE METHODS FOR MISSILE CONFIGURATIONS Final Report, May 1982 - May 1985
G. H. Klopfer Jul. 1985 15 p
(Contract DAAG29-82-C-0016)
(AD-A158358; NEAR-350; ARO-18670.1-EGS) Avail: NTIS HC A02/MF A01 CSCL 20/4

This report provides an overview of the numerical research conducted on steady supersonic inviscid flows with crossflow separation during the period of May 1982 through May 1985. The publications resulting from that research are summarized. GRA

N86-14253# Arnold Engineering Development Center, Arnold Air Force Station, Tenn.
STATIC STABILITY TEST OF THREE ELLIPTIC MISSILE BODY CONFIGURATIONS Final Report
M. E. Sellers May 1985 29 p
(AD-A158718; AEDC-TSR-85-P8) Avail: NTIS HC A03/MF A01 CSCL 20/4

A wind tunnel test was conducted to obtain data on the aerodynamic characteristics of three elliptic missile body configurations. The test was performed at nominal Mach numbers from 0.4 to 1.3 at a constant nominal free-stream unit Reynolds number of 2.4 million per ft. The angle-of-attack range was -4 to 20 deg at sideslip angles of 0 and 4 deg. Only sample tabulations of the test results are included in the report. GRA

N86-14254# Naval Postgraduate School, Monterey, Calif.
TRAILING VORTEX ATTENUATION DEVICES M.S. Thesis
K. G. Heffernan Jun. 1985 110 p
(AD-A159535) Avail: NTIS HC A06/MF A01 CSCL 20/4

Trailing vortices generated by large aircraft pose a serious hazard to other planes. Numerous studies have been carried out to destroy them either before and/or after their formation. The present investigation is a survey and critical assessment of all the known active/passive devices and wingtip modifications proposed to achieve vortex attenuation. It is concluded that some devices, such as the wing tip sails, have promise in affecting the vortex roll-up in the vicinity of the aircraft. However, more data and analysis

on this and other devices are needed before they can be incorporated into existing aircraft or future designs. GRA

N86-14255# Texas A&M Univ., College Station. Dept. of Aerospace Engineering.
ADDENDUM TO A CATALOG OF LOW REYNOLDS NUMBER AIRFOIL DATA FOR WIND TURBINE APPLICATIONS
S. J. Miley Feb. 1985 87 p
(Contract DE-AC02-83CH-10093)
(DE85-008784; SERI/STR-217-2584) Avail: NTIS HC A05/MF A01

The prediction of wind turbine performance requires airfoil data at Reynolds numbers lower than those used for aircraft operation. A catalog of low Reynolds number airfoil data for wind turbine applications, published in 1982 by Rockwell International Corporation, included airfoil data up to a Reynolds number of 3,000,000. After the catalog was finished, it was brought to the author's attention that the cubic spline fitting routine used in generating the curves from discrete data caused inaccuracies in some of the airfoils. A point-to-point curve fitting routine produced more accurate results. This addendum corrects the drag data for the affected airfoils, and is formatted to correlate with the original catalog. DOE

N86-14256# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Inst. fuer Theoretische Stroemungsmechanik.
CALCULATION OF SEPARATED LAMINAR SUPERSONIC FLOWS OVER BLUNT BODIES OF REVOLUTION AT ZERO ANGLE OF ATTACK Ph.D. Thesis - Technische Hochschule, Aachen
Bernhard Mueller Apr. 1985 142 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-953) Sponsored by Deutsche Forschungsgemeinschaft
(DFVLR-FB-85-30; D-82; ISSN-0171-1342) Avail: NTIS HC A07/MF A01; DFVLR, Cologne DM 40.50

The applicability of the thin layer approximation method for the description of thin separation bubbles and large separation areas and data acquisition on the structure of separated three dimensional flow distribution is studied using the numerical simulation of separated laminar supersonic flows over blunt bodies of revolution. The influence of numerical damping on the consistency, stability, convergence and accuracy of the finite difference scheme of Beam and Warming is studied. The topologic stucture of the separation area depends on the Reynolds number. The thin layer approximation allows an accurate description of flows with small or large separation areas at high Reynolds numbers.
Author (ESA)

N86-14257# Messerschmitt-Boelkow-Blohm G.m.b.H., Bremen (West Germany). Unternehmensbereich Transporter.
INTEGRATED WING ENGINE SYSTEM (IFAS), PHASE 2 Final Report, Jun. 1984
Joachim Szodruch Bonn Bundesministerium fuer Forschung und Technologie Jun. 1985 111 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-85-008; MBB-TE-2-1370; ISSN-0170-1339) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 23.50

Computational aerodynamic design methods were developed to study the interference transonic flow on engine-wing and body-wing configurations using the hybrid method and flow simulation in wind tunnels. Transonic wing technology was improved regarding fineness ratio, lift and zero moment, stability and buffeting limit on airfoils with economical production methods. Design criteria for transonic wings strong interference were determined in studying the wing-body transition area with existing and newly designed shapes, and the engine-wing interference area with half and complete models. Measurements in subsonic and transonic flows were made using a turbo-powered simulator. High lift systems on transonic wings were studied to improve flap efficiency based on the Swept Constant Chord Halfmodel results, and to design high lift principles for a transonic wing as used on the A-320 aircraft.
Author (ESA)

N86-14422# Yamaguchi Univ., Ube (Japan).
THE PROPERTIES OF A ROW OF TRAILING VORTICES GENERATED IN THE UNIFORM FLOW. THE PATH OF TRAILING VORTEX
Hideo Osaka, Toshiaki Yamaguchi, and Yoshiro Kageyama *In its* Memoirs of the Faculty of Engineering, Yamaguchi University, Vol. 36, No. 1 Oct. 1985 p 25-29 refs In JAPANESE; ENGLISH summary (For primary document see N86-14418 05-31)
(Rept-1) Avail: NTIS HC A09/MF A01

N86-14423# Yamaguchi Univ., Ube (Japan).
THE PROPERTIES OF A ROW OF TRAILING VORTICES GENERATED IN THE UNIFORM FLOW. SHAPE OF TRAILING VORTEX AND ITS STREAMWISE VARIATION
Hideo Osaka, Toshiaki Yamaguchi, and Yoshiro Kageyama *In its* Memoirs of the Faculty of Engineering, Yamaguchi University, Vol. 36, No. 1 Oct. 1985 p 31-36 refs In JAPANESE; ENGLISH summary (For primary document see N86-14418 05-31)
(Rept-2) Avail: NTIS HC A09/MF A01

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N86-14258 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Transport Research Dept.
THE EFFECT OF SUPPLY PARAMETERS ON THE VOLUME OF FUTURE AIRCRAFT MOVEMENTS
Eckhard Urbatzka 1985 6 p Presented at WCTR '83 Conf., Hamburg, West Germany, 26-29 Apr. 1983
Avail: Issuing Activity

A method for estimating future volumes of aircraft movements for airport planning is described. It requires a route specific analysis of passenger load factor, aircraft mixture (and thus seats per flight), and flight frequency. The method is unsuitable for computerization. For each route domestic and foreign air transport policies; past, present and future demand; development and structure of supply; the development of aircraft fleets of airlines involved, and the world aircraft market must be considered. Author (ESA)

N86-14259# Dayton Univ., Ohio.
FINITE ELEMENT ANALYSIS OF SOFT-BODY IMPACT Final Report, Sep. 1982 - Mar. 1984
R. A. Brockman Oct. 1984 106 p
(Contract F33615-82-K-3408)
(AD-A158438; UDR-TR-84-09; AFWAL-TR-84-3035) Avail: NTIS HC A06/MF A01 CSCL 20/1

This report describes the development of analytical and numerical methods for determining the dynamic structural response caused by soft body impact. The prediction of stress and deflection behavior of aircraft transparencies due to collisions with birds is the primary area of application. When the structure is relatively flexible, such an impact involves strong coupling between the dynamic motion of the colliding bodies. The developed techniques use appropriate finite element methods in each region, together with a contact solution algorithm, to compute the coupled structural response, while the soft-body motions are integrated using a simpler explicit technique. The soft body dynamic analysis uses a Lagrangian description to track the free surface and impact region accurately, with an automatic rezoning procedure to correct large mesh distortions. GRA

N86-14260# Federal Aviation Administration, Washington, D.C. Office of Civil Aviation Security.
EFFECTIVENESS OF THE CIVIL AVIATION SECURITY

PROGRAM Semiannual Report, 1 Jul. - 31 Dec. 1984
12 Apr. 1985 20 p
(AD-A159511; FAA-ACS-84-2-21; SAR-21) Avail: NTIS HC A02/MF A01 CSCL 01/2

This report provides details on the effectiveness of security screening of passengers and all property intended to be carried in the aircraft cabin in air transportation or intrastate air transportation. It also provides a statistical summary of aircraft hijackings and alleged violations of Federal Aviation regulations pertaining to security screening. GRA

N86-14261# Luftfahrt-Bundesamt, Brunswick (West Germany). Flugunfalluntersuchungsstelle.
RESULTS OF THE EXPERT STUDY OF ACCIDENTS DURING OPERATION OF GERMAN AIRCRAFT IN THE HOMELAND AND ABROAD AS WELL AS OF FOREIGN AIRCRAFT IN THE HOMELAND Annual Report, 1980 [ERGEBNISSE DER FACHLICHEN UNTERSUCHUNG VON UNFAELLEN BEI DEM BETRIEB DEUTSCHER LUFTFAHRZEUGE IM IN- UND AUSLAND SOWIE AUSLAENDISCHE LUFTFAHRZEUGE IM INLAND]
Mar. 1985 116 p In GERMAN
Avail: NTIS HC A06/MF A01

Aircraft accidents which occurred during 1980 are listed. Aircraft categories (transport aircraft; helicopters, gliders; parachutes; balloons, other) causes; aircraft accident distribution; types of operations or flights during which the accidents occurred; and severity (casualties, injuries), are reported. Author (ESA)

N86-14262# Luftfahrt-Bundesamt, Brunswick (West Germany). Flugunfalluntersuchungsstelle.
RESULTS OF THE EXPERT STUDY OF ACCIDENTS DURING OPERATION OF GERMAN AIRCRAFT IN THE HOMELAND AND ABROAD AS WELL AS OF FOREIGN AIRCRAFT IN THE HOMELAND Annual Report, 1981 [ERGEBNISSE DER FACHLICHEN UNTERSUCHUNG VON UNFAELLEN BEI DEM BETRIEB DEUTSCHER LUFTFAHRZEUGE IM IN- UND AUSLAND SOWIE AUSLAENDISCHE LUFTFAHRZEUGE IM INLAND]
Apr. 1985 125 p In GERMAN
Avail: NTIS HC A06/MF A01

Aircraft accidents which occurred during 1981 are listed. Aircraft categories (transport aircraft, helicopters, gliders; parachutes; balloons; other) causes; aircraft accident distribution; types of operations or flights during which the accidents occurred; and severity (casualties, injuries) are given. Author (ESA)

N86-14263# National Aerospace Lab., Amsterdam (Netherlands). Flight Div.
FUEL SAVING BY OPTIMAL INTEGRATION OF ON-BOARD AVIONICS AND AIR TRAFFIC CONTROL
J. M. tenHaven Apr. 1984 23 p refs Submitted for publication
(NLR-MP-84035-U; B8566435) Avail: NTIS HC A02/MF A01

The possibilities for airlines to cut operating costs by ensuring that aircraft follow the most energy efficient flight plans are discussed. The role of air traffic control is explained, and benefits from developments such as flight management systems and secondary surveillance radar are considered. Author (ESA)

N86-14264# General Accounting Office, Washington, D. C. Resources Community and Economic Development Div.
COMPILATION AND ANALYSIS OF THE FEDERAL AVIATION ADMINISTRATION'S INSPECTION OF A SAMPLE OF COMMERCIAL AIR CARRIERS
2 Aug. 1985 157 p
(PB85-241198; GAO/RCED-85-157; B-219729) Avail: NTIS HC A08/MF A01 CSCL 01C

A compilation and analysis of data concerning the Federal Aviation Administration's (FAA's) inspection of 92 of the approximately 500 of the nation's scheduled commercial air carriers are given. These data are representative of FAA's inspections of about 350 air carriers during fiscal year 1984. This review was directed at FAA's responsibility under the Federal Aviation Act, as amended (49 U.S.C. 1421), to monitor and inspect air carrier operations and maintenance to assure compliance with federal safety regulations and FAA-approved air carrier policies and procedures. FAA's avionics, maintenance, and operations inspectors implement this responsibility by conducting inspections of air carrier personnel, aircraft, and maintenance and other facilities. Information is given on the type, frequency, and results of FAA's fiscal year 1984 air carrier inspections. GRA

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

N86-14265# Aerospace Corp., El Segundo, Calif. Weather and Navigation Div.
A 406 MHz GLOBAL POSITIONING SYSTEM/EMERGENCY LOCATION TRANSMITTER FOR SEARCH AND RESCUE SATELLITE OPERATIONS Interim Report
K. P. Maine 15 Apr. 1985 13 p
(Contract F04701-83-C-0084)
(AD-A158642; TR-0084A(5476-04)-1; SD-TR-85-56) Avail: NTIS HC A02/MF A01 CSCL 17/2

The SARSAT (Search and Rescue Satellite) has demonstrated the use of 121.5/243.0 MHz beacons to locate the victims of aircraft and marine accidents. An experimental 406 MHz Emergency Location Transmitter (ELT) has been developed by NASA allowing a digital message containing identification and timing information as an alternative to the tone modulation signal provided on the 121.5/243.0 MHz ELT. Utilization of Global Positioning System (GPS) information with the 406 MHz ELT could greatly enhance the accuracy of the SARSAT system by including GPS position coordinates within the digital message. Location accuracies of less than 100 meters could be provided worldwide, which is ten times better than that available with the experimental 406 MHz ELT. GRA

N86-14266# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensgruppe Hubschrauber und Flugzeuge.
AVIONICS SYSTEM FOR FUTURE CIVIL HELICOPTERS Final Report, Sep. 1984
Bernard Formica Bonn Bundesministerium fuer Forschung und Technologie May 1985 168 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-85-005; MBB-UD-426/84; ISSN-0170-1339) Avail: NTIS HC A08/MF A01, Fachinformationszentrum, Karlsruhe, West Germany DM 33.50

Avionics and visual aids systems were tested to determine their applicability to civil helicopters. Economical uses, compatibility with the cockpit layout, the effects on the crew regarding work strain, and their reliability and mission capability were studied. Visual aids based on infrared imagery and light amplifying devices; central displays; autonomous navigation systems; obstacle warning radar; and central control and display units were considered. Author (ESA)

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N86-14267*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

DETERMINATION OF CORRECTIONS TO FLOW DIRECTION SENSOR MEASUREMENTS OVER AN ANGLE-OF-ATTACK RANGE FROM 0 DEGREE TO 85 DEGREES M.S. Thesis - George Washington Univ., August 1983
Thomas M. Moul Dec. 1985 52 p refs
(NASA-TM-86402; L-15759; NAS 1.15:86402) Avail: NTIS HC A04/MF A01 CSCL 01C

An investigation was conducted into the nature of corrections for angle-of-attack and angle-of-sideslip measurements obtained with sensors mounted in front of each wingtip of a general aviation airplane. These flow corrections have been obtained from both wind-tunnel and flight tests over an angle-of-attack range from 0 to 85 deg. Both the angle-of-attack and angle-of-sideslip flow corrections were found to be substantial. The corrections were a function of the angle of attack and angle of sideslip and were fairly insensitive to configuration changes and rotational effects. The angle-of-attack flow correction determined from the static wind-tunnel tests agreed reasonably well with the correction determined from flight tests. Author

N86-14268# Naval Postgraduate School, Monterey, Calif.
COMPUTER PROGRAM FOR PERFORMANCE PREDICTION OF TANDEM-ROTOR HELICOPTERS M.S. Thesis
D. L. Cotner Jun. 1985 42 p
(AD-A159193) Avail: NTIS HC A03/MF A01 CSCL 01/3

A computer program for the HP-41 series calculator is presented which predicts the rotor shaft horsepower required for tandem-rotor helicopters to a given set of helicopter parameters and flight conditions. Three simplified analytical methods of calculating the induced power for tandem-rotor helicopters were explored during the development of the program and their effect on the total shaft horsepower required was compared to actual test data. These comparisons as well as size and complexity considerations were used in selecting the method to be used. The program can be used in preliminary design analysis and as an educational tool where only an estimate of the actual shaft horsepower is required. Author (GRA)

N86-14269# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Hauptabt. Verkehrsforschung.
INVESTIGATIONS OF THE AIRCRAFT LANDING PROCESS USING A COMPUTERIZED SIMULATION MODEL BASED ON THE MONTE CARLO METHOD
Hanns-Juergen Peters May 1985 111 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-951)
(DFVLR-FB-85-27; ISSN-0171-1342) Avail: NTIS HC A06/MF A01; DFVLR, Cologne DM 35.50

A landing approach simulation model based on the data from a civil airport and on the Monte Carlo theory is developed using the General Purpose Simulation System on FORTRAN 4. The model is improved to investigate the landing process with constant and variable landing times. The theoretical landing time distribution with waiting times verified with the Chi-square test show good agreement with the empirical landing time distribution. The turn time and landing time distribution with waiting time parameters are verified by statistical comparison of the simulated distribution and the empirical one. The efficiency of the test distributions is improved with a relevant landing time delimitation. The test distributions are tested successfully in other airports. Author (ESA)

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

N86-14270# National Aerospace Lab., Tokyo (Japan).
DYNAMIC CHARACTERISTICS OF AIR DATA SENSOR SYSTEMS: ALTIMETER, SPEEDOMETER AND ALPHA X BETA VANE
Yukichi Tsukano and Takatsugu Ono 1985 20 p refs In JAPANESE; ENGLISH summary
(NAL-TR-852; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

Dynamic response characteristics of air-data-sensor systems including a pressure altitude sensor, a dynamic pressure sensor and a alpha beta vane are described in this paper. These air data sensors are currently used as part of instrumentation systems for the Variable Stability and Response Airplane (VSRA). Responses of the pressure sensor system to stepwise inputs from both static and total pressure ports were measured and analyzed to identify the dynamic model of the system, which is assumed to be linear. Response of a alpha beta vane to initial displacement were measured in a 2 m diameter wind tunnel at wind speeds from 30 m/s to 55 m/s and the assumed dynamic model including weak nonlinearity was identified. Author

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N86-14271*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
TURBINE BLADE THERMAL FATIGUE TESTING PRATT AND WHITNEY AIRCRAFT HOLLOW CORE BLADES
Jeff Ingram and Loren Gross Sep. 1985 18 p
(NASA-TM-86528; NAS 1.15:86528) Avail: NTIS HC A02/MF A01 CSCL 21E

The results of low cycle fatigue testing on turbine blades for use in hydrogen/oxygen rocket engines is presented. Cored blade and cored blades with circulation were tested in the MSFC thermal fatigue tester. Both blade configurations showed significant low cycle fatigue life improvements when compared to baseline solid blades. Author

N86-14272*# Pratt and Whitney Aircraft, East Hartford, Conn. Engineering Div.
PRELIMINARY DESIGN OF A SUPERSONIC CRUISE AIRCRAFT HIGH-PRESSURE TURBINE Final Report
L. D. Aceto and J. C. Calderbank 2 Nov. 1983 128 p refs
(Contract NAS3-20357)
(NASA-CR-174878; NAS 1.26:174878; PWA-5923-14) Avail: NTIS HC A07/MF A01 CSCL 21E

Development of the supersonic cruise aircraft engine continued in this National Aeronautics and Space Administration (NASA) sponsored Pratt and Whitney program for the Preliminary Design of an Advanced High-Pressure Turbine. Airfoil cooling concepts and the technology required to implement these concepts received particular emphasis. Previous supersonic cruise aircraft mission studies were reviewed and the Variable Stream Control Engine (VSCE) was chosen as the candidate or the preliminary turbine design. The design was evaluated for the supersonic cruise mission. The advanced technology to be generated from these designs showed benefits in the supersonic cruise application and subsonic cruise application. The preliminary design incorporates advanced single crystal materials, thermal barrier coatings, and oxidation resistant coatings for both the vane and blade. The 1990 technology vane and blade designs have cooled turbine efficiency of 92.3 percent, 8.05 percent Wae cooling and a 10,000 hour life. An alternate design with 1986 technology has 91.9 percent efficiency and 12.43 percent Wae cooling at the same life. To

achieve these performance and life results, technology programs must be pursued to provide the 1990's technology assumed for this study. Author

N86-14273# Joint Publications Research Service, Arlington, Va.
USSR REPORT: TRANSPORTATION
24 Oct. 1985 121 p Transl. into ENGLISH from various Russian articles
(JPRS-UTR-85-012) Avail: NTIS HC A06

Recent advances in transportation are highlighted in this U.S.S.R. report. Topics discussed include: civil aviation; motor vehicles and highways; rail systems; maritime and river fleets; and ports and transshipment centers. For individual titles, see N86-14274 through N86-14274.

N86-14274# Joint Publications Research Service, Arlington, Va.
AN-22 TEST BED FOR ADVANCED PROPELLER TECHNOLOGY
V. Belikov *In its* USSR Report: Transportation (JPRS-UTR-85-012) 24 Oct. 1985 p 22-23 Transl. into ENGLISH from Izvestiya (Moscow), 12 Jul. 1985 p 1 and 6 (For primary document see N86-14273 05-07)
Avail: NTIS HC A06

The technological and historical development of the turbofan engine is described. Designers and scientists have given birth to a multiple-bladed propeiler which has been named the fan propeller. Flight tests carried out with the fan propeller on the AN-32 aircraft have resulted in increased fuel consumption and greater flying speed. Less noise and vibration problems were reported with the new propeliers. B.W.

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N86-14275*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
DEVELOPMENT OF A FLIGHT TEST MANEUVER AUTOPILOT FOR AN F-15 AIRCRAFT
Gurbux S. Alag and Eugene L. Duke (Univ. of Western Michigan) Dec. 1985 8 p refs Presented at the 24th IEEE Conf. on Decision and Control, 11 Dec. 1985 Sponsored in part by National Research Council Fellowship
(NASA-TM-86799; H-1328; NAS 1.15:86799) Avail: NTIS HC A02/MF A01 CSCL 01C

An autopilot can be used to provide precise control to meet the demanding requirements of flight research maneuvers with high-performance aircraft. This paper presents the development of control laws for a flight test maneuver autopilot for an F-15 aircraft. A linear quadratic regulator approach is used to develop the control laws within the context of flight test maneuver requirements by treating the maneuver as a finite time tracking problem with regulation of state rates. Results are presented to show the effectiveness of the controller in insuring acceptable aircraft performance during a maneuver. Author

N86-14276*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A FLIGHTPATH OVERSHOOT FLYING QUALITIES METRIC FOR THE LANDING TASK
Donald T. Berry Jan. 1986 11 p refs To be presented at the AIAA 24th Aerospace Sciences Meeting, Reno, Nevada, 6-9 January 1986
(NASA-TM-86795; H-1322; NAS 1.15:86795; AIAA-Paper-86-0334) Avail: NTIS HC A02/MF A01 CSCL 01C

An analysis was conducted of the attitude and flightpath angle response of configurations used in the Total In-Flight Simulator (TIFS) pitch-rate command systems program. The results show poor correlation between pilot ratings and attitude response and indicate that attitude was not a major influence in the results. A strong correlation was found to exist, however, between the amount of flightpath angle peak overshoot and the pilot ratings. This correlation is similar to the best correlations that have been obtained in recent closed-loop and time-domain analyses but has the advantage of greatly simplified implementation and interpretation. Author

N86-14277*# Boeing Commercial Airplane Co., Seattle, Wash. Preliminary Design Dept.
INTEGRATED APPLICATION OF ACTIVE CONTROLS (IAAC) TECHNOLOGY TO AN ADVANCED SUBSONIC TRANSPORT PROJECT: TEST ACT SYSTEM DESCRIPTION Final Report, Jul. 1981 - Jul. 1983
Dec. 1983 270 p refs
(Contract NAS1-15325)
(NASA-CR-172221; NAS 1.26:172221; D6-51825) Avail: NTIS HC A12/MF A01 CSCL 01C

The engineering and fabrication of the test ACT system, produced in the third program element of the IAAC Project is documented. The system incorporates pitch-augmented stability and wing-load alleviation, plus full authority fly-by-wire control of the elevators. The pitch-augmented stability is designed to have reliability sufficient to allow flight with neutral or negative inherent longitudinal stability. E.A.K.

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N86-14278*# Madison Magnetics, Inc., Wis.
MAGNETIC SUSPENSION AND BALANCE SYSTEM ADVANCED STUDY Final Report, Dec. 1984 - Jun. 1985
R. W. Boom, Y. M. Eyssa, G. E. McIntosh, and M. K. Abdelsalam Washington NASA Oct. 1985 122 p refs
(Contract NAS1-17931)
(NASA-CR-3937; NAS 1.26:3937) Avail: NTIS HC A06/MF A01 CSCL 14B

An improved compact design for a superconducting magnetic suspension and balance system for an 8 ft. x 8 ft. transonic wind tunnel is developed. The original design of an MSBS in NASA Cr-3802 utilized 14 external superconductive coils and a superconductive solenoid in the airplane test model suspended in a wind tunnel. The improvements are in the following areas: test model solenoid options, dynamic force limits on the model, magnet cooling options, structure and cryogenic designs, power supply specifications, and cost and performance evaluations. The improvements are: MSBS cost reduction of 28%, weight; reduction of 43%, magnet system ampere-meter reduction of 38%, helium liquifier capacity reduction by 33%, magnet system stored energy reduction by 55%, AC loss to liquid helium reduced by 76%, system power supply reduced by 68%, test coil pole strength increased by 19%, wing magnetization increased by 40%, and control frequency limit increased by 200% from 10 Hz to 30 Hz. The improvements are due to: magnetic holmium coil forms in the test model, better rare earth permanent magnets in the wings, fiberglass-epoxy structure replacing stainless steel, better coil configuration, and new saddle roll coil design. Author

N86-14279# Air Force Human Resources Lab., Brooks AFB, Tex.
ADVANCED SIMULATOR FOR PILOT TRAINING: EFFECTS OF COLLIMATION ON ACCOMMODATION AND VERGENCE Interim Technical Paper, Oct. 1983 - Jun. 1984
H. H. Bell and K. J. Ciuffreda Sep. 1985 13 p
(AF Proj. 112-3)
(AD-A159545; AFHRL-TP-85-27) Avail: NTIS HC A02/MF A01

CSCL 06/16

Accommodation and binocular vergence were measured using a haploscope optometer for 10 observers who viewed collimated (0.15 diopter) and noncollimated presentations of a simulated approach and landing. Collimated imagery produced a small but consistent decrease in accommodation for each observer (M = 12.7 meters). Collimation also produced an increase in the perceived size of objects within the visual scene. These results suggest that the primary influence of collimation is on binocular vergence and that differences in the perceived quality of collimated and noncollimated simulator displays are due to differences in binocular vergence rather than in accommodation. GRA

N86-14449# Joint Publications Research Service, Arlington, Va.
CONFIGURATION AND LONGITUDINAL WIND TUNNEL TESTING]HY] OF FORWARD-SWEPT WINGS
Weiliang Ye and Renxi Xiao *In its* China Report: Science and Technology (JPRS-CST-85-036) 23 Oct. 1985 p 80-90 refs Transl. into ENGLISH from Kongqidonglixue Xuebao (Mianyang, China), no. 2, Jun. 1985 p 61-68 (For primary document see N86-14443 05-31)
Avail: NTIS HC A07/MF A01

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

No abstracts in this category.

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N86-14280# Ebeling Associates, Inc., Scotia, N.Y.
GENERAL PERTURBATION SATELLITE THEORY Final Report
R. H. Lyddane Sep. 1984 82 p
(Contract N60921-81-M-D849)
(AD-A158469; AD-F350044; NSWC-TR-84-25) Avail: NTIS HC A05/MF A01 CSCL 22/3

The theory considers the satellite orbit perturbations due to an arbitrary zonal harmonic gravitational field of the Earth and the accelerations due to Sun and Moon. First-order short-period terms are determined by the von Zeipel technique. The remaining long-periodic equations of motion are integrated numerically with step sizes on the order of 0.25 days. GRA

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air).*

No abstracts in this category.

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N86-14281*# National Aeronautics and Space Administration. Johnson (Lyndon B.) Space Center,
ADVANCING AUTOMATION AND ROBOTICS TECHNOLOGY FOR THE SPACE STATION AND THE US ECONOMY Progress Report, Apr. - Sep. 1985
Aaron Cohen Sep. 1985 54 p refs Previously announced as N85-22460 and N85-22461 2 Vol.
(NASA-TM-87772; NAS 1.15:87772; PR-1) Avail: NTIS HC A04/MF A01 CSCL 22B

In response to Public Law 98-371, dated July 18, 1984, the NASA Advanced Technology Advisory Committee has studied automation and rebotics for use in the space station. The Executive Overview, Volume 1 presents the major findings of the study and recommends to NASA principles for advancing automation and robotics technologies for the benefit of the space station and of the U.S. economy in general. As a result of its study, the Advanced Technology Advisory Committee believes that a key element of technology for the space station is extensive use of advanced general-purpose automation and robotics. These systems could provide the United States with important new methods of generating and exploiting space knowledge in commercial enterprises and thereby help preserve U.S. leadership in space. Author

N86-14282# Army Armament Research and Development Command, Dover, N. J. Large Caliber Weapon Systems Lab.
AN ANALYTICAL MODULARIZED TREATMENT OF AUTOPILOTS FOR GUIDED PROJECTILE SIMULATIONS
E. M. Friedman and M. J. Amoruso Aug. 1985 42 p
(AD-A159311; AD-E401390; ARLCD-TR-85025) Avail: NTIS HC A03/MF A01 CSCL 19/1

An innovative technique was developed by which piecewise analytical solutions to guidance and control transfer functions were obtained for use in larger but lower frequency computer simulations of guided munitions. Numerical integration, which is typically used to treat such transfer functions, significantly reduces the integration time step, and increases computer execution time for the overall simulation. The modularized analytical approach accommodates integration time steps associated with the lower frequencies of airframe dynamics which results in faster simulation execution and considerable savings in cost and execution time. GRA

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N86-14283# British Aerospace Dynamics Group, Stevenage (England). Space and Communications Div.
IN-ORBIT TECHNOLOGY DEMONSTRATION MISSION PHASE 1 STUDY WITH HALF PALLET Final Report
B. F. Haydon, comp. Paris ESA 1984 209 p refs
(Contract ESA-5712/83/NR-PR)
(BAe-TP-8151; ESA-CR(P)-2038) Avail: NTIS HC A10/MF A01

The utilization of a Half Pallet to carry experiments and provide a real space environment for their technological demonstration was studied. A sortie mode mission was assumed, i.e., the Half Pallet Carrier remains in STS Orbiter cargo bay throughout the mission. The assessment shows that the Half Pallet meets all the prime objectives in terms of technical requirements, maximum flexibility for subsequent missions, and availability of qualified hardware. Including the maximum number of experiments on one mission amortises total mission costs over the largest number of

experiments and is the most cost effective approach. The main driver in mission configurations is the requirement for sill plane mounting and it is recommended that work is concentrated on utilizing the Half Pallet with a platform or bridge structure. Only 7 of 50 candidate experiments are unsuitable for a sortie mode mission. It is advantageous to increase overall payload length to 2.29 m to gain access to Orbiter services. Author (ESA)

N86-14284# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany).
FIRST GERMAN SPACELAB MISSION D1 REPORTS [ERSTE DEUTSCHE SPACELAB-MISSION D1-REPORT]
Apr. 1985 6 p In GERMAN
Avail: NTIS HC A02/MF A01

Spacelab payload delivery to NASA and payload integration; experiments in weightlessness; vegetation growth; the problem of water supply; single crystal production; Earth observations from space; satellite applications for photomapping, land use diagnosis and atmospheric research; development of a synchronizing process for telecommunication satellites; earthquake prediction; and water surface measurement are discussed. Author (ESA)

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

N86-14285# Mitre Corp., McLean, Va.
RELATIVISTIC EFFECTS IN THE GLOBAL POSITIONING SYSTEM
D. Eardley, F. Dyson, P. Horowitz, W. Press, and M. Ruderman May 1985 18 p
(Contract F19628-84-C-0001)
(AD-A158720; JSR-84-104) Avail: NTIS HC A02/MF A01 CSCL 17/7

A group of scientists have for a number of years been claiming that relativistic corrections are not taken into account in GPS system design. Rather, they claim that there are fundamental errors in system design having to do with relativity theory, and that the system will consequently fail to meet its specifications. DARPA requested that JASON consider the issue during its 1984 Summer Study. Our major conclusion is that these claims about GPS are completely invalid; the fundamentals of relativistic time synchronization on which the system is based are valid. GRA

N86-14286# California Univ., Berkeley. Lawrence Berkeley Lab.
LECTURES ON PROBABILITY AND STATISTICS, REVISION
G. P. Yost Jun. 1985 151 p Previously announced as N85-26291
(Contract DE-AS03-76SF-00098)
(DE85-016571; LBL-16993-Rev) Avail: NTIS HC A08/MF A01

These notes are based on a set of statistics lectures delivered at Imperial College to the first-year postgraduate students in High Energy Physics. They are designed for the professional experimental scientist. We begin with the fundamentals of probability theory, in which one makes statements about the set of possible outcomes of an experiment, based upon a complete a priori understanding of the experiment. For example, in a roll of a set of (fair) dice, one understands a priori that any given side of each die is equally likely to turn up. From that, we can calculate the probability of any specified outcome. We finish with the inverse problem, statistics. Here, one begins with a set of actual data (e.g., the outcomes of a number of rolls of the dice), and attempts to make inferences about the state of nature which gave those data (e.g., the likelihood of seeing any given side of any given die turn up). This a much more difficult problem, of course, and one's solutions often turn out to be unsatisfactory in one respect or another. Author (DOE)

N86-14287# Teldix Luftfahrt-Ausruestungs G.m.b.H., Heidelberg (West Germany).
HEMISPHERICAL POINTING MECHANISM (HPM) Final Report
H. Heimel and H. H. Schulz Paris ESA 26 Oct. 1984 189 p refs
(Contract ESTEC-4904/81/NL-AK(SC))
(TELDIX-15-020-769; ESA-CR(P)-2076) Avail: NTIS HC A09/MF A01

The Hemispherical Pointing Mechanism (HPM) was designed for wide angle, high accuracy pointing and tracking of medium to large spacecraft payloads. The concept employs two positioning axes arranged at an angle of 47.5 deg with respect to each other. A third axis is provided at the payload interface to allow an additional rotation of the payload. Identical drive units are used at all three axes, with almost identical frames between them. An on-board computer enables the HPM to perform in a variety of operation modes, including automatic tracking with or without the use of external sensors. An RF linkage model with rotary joints was built to demonstrate the feasibility of an RF option for the supply of antenna payloads. Other payload interface options can be incorporated as well. The mass limit of 12 kg can almost be met, but the mechanism is not strong enough to support larger payloads during launch without clamping. Author (ESA)

N86-14288# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany).
STUDY OF SATELLITE MOBILE COMMUNICATION SYSTEMS FOR THE COVERAGE OF POLAR REGIONS Final Report
Paris ESA Nov. 1984 574 p refs Sponsored by ANT Nachrichtentechnik GmbH
(Contract ESA-5697/83/F-RD(SC))
(ESA-CR(P)-2088) Avail: NTIS HC A24/MF A01

Satellite mobile communication systems for polar coverage complementary to the INMARSAT space segment were investigated. Services to be provided include low data rate communication, automated reception of distress calls, transmitted by emergency beacons (EPIRB), radio location of EPIRBs based on Doppler techniques, and voice communication. The systems use the L-band for links between satellites and mobiles, and the 4/6 GHz bands for feeder links. Seven systems with orbits varying between altitudes below the Van Allen Belt and inclined geosynchronous orbits were compared as to complexity; possibility of permanent contact to polar regions with or without intersatellite links; feasibility and quality of communication; and number of satellites and fixed Earth stations. The configuration selected is characterized by only three satellites in a circular polar orbit (12,000 km altitude) and 7 to 9 fixed Earth stations. The satellite payload can be simple and the system offers permanent contact without intersatellite links. Author (ESA)

N86-14289# Netherlands Bibliographical and Documentary Committee, Amsterdam.
THE APOLLO EXPERIMENT FOR DOCUMENT DELIVERY VIA SATELLITE COMMUNICATION [APOLLO: EXPERIMENT VOOR DOCUMENTLEVERANTIE VIA SATELLIETVERBINDINGEN]
25 Mar. 1985 43 p In DUTCH
(B8515281) Avail: NTIS HC A03/MF A01

Dutch participation possibilities in the Apollo document delivery project, wishes and idea's of potential user and tender groups, and plans and activities of Dutch institutes and companies, are surveyed. The Apollo storage and transport system, demand and administration network, potential markets, and subject areas of the documents are investigated. Utilization areas (scientific, technical, administration, and business information) are listed. High tariffs and the lack of necessary provision make a direct participation strategy impossible. However, in the experimental phase, Dutch companies must be allowed to contribute in technical developments and availability of organizational and technical facilities must be stimulated. Author (ESA)

N86-14290# National Aerospace Lab., Amsterdam (Netherlands). Informatics Div.
CHANNEL CODING WITH THE (255, 255-2T) REED-SOLOMON CODES OVER GF(256)

H. J. Simons and H. F. A. Roefs 29 Mar. 1984 12 p refs Presented at the 5th Symposium on Information Theory in the Benelux, Aalten, 24-25 May 1984
(Contract NIVR-1979)
(NLR-MP-84033-U; B8566807) Avail: NTIS HC A02/MF A01

Fast encoding and decoding algorithms for the class of variable T error correcting (255, 255-2T) Reed-Solomon codes over GF(256) are described. For implementation of encoding and decoding algorithms in programmable digital signal processors, which must operate at high transmission speeds, and where the number of operations must be kept at a minimum, it is shown that the fast Fourier transform and Horner's scheme for polynomial evaluation are a successful means to reduce the computational complexity. Author (ESA)

N86-14468*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
MARK 4-A DSCC TELEMETRY SYSTEM DESCRIPTION
D. L. Ross *In its* The Telecommunications and Data Acquisition Report 15 Nov. 1985 p 92-100 refs (For primary document see N86-14457 05-32)
Avail: NTIS HC A10/MF A01 CSCL 09F

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

N86-14291* National Aeronautics and Space Administration, Washington, D.C.
NASA SPACE SYSTEMS TECHNOLOGY MODEL
Jun. 1985 588 p refs 6 Vol.
(NASA-TM-88174; NAS 1.15:88174) Avail: NASA Headquarters, Code R CSCL 22B

The sixth edition of the NASA Space Systems Technology Model contains a revised format. Three items have been published - a Model document, a Data Base and an Executive Summary. The Data Base consists of material in three areas: Space Technology Trends and Forecasts (vol. 1, Parts A and B), Analysis of Technology Needs (vol. 2) and Mission Payloads (vol. 3). The Trends and Forecasts part contains data characterizing space technology developments and covers 15 topics. The Analysis of Technology Needs consists of summaries of detailed examinations of stated or implied space technology requirements. Mission Payloads presents information on both near and far term missions regarding instruments and experiments for mission systems/programs endorsed by NASA program offices. The Model document is comprised of material covering four categories of information: Future Mission Systems, Trends and Forecasts, Technology Analysis Results and Landmark Mission Systems. Summaries and tabulations of technology forecasts are presented. Author

N86-14292* National Aeronautics and Space Administration, Washington, D.C.
NASA SPACE SYSTEMS TECHNOLOGY MODEL. VOLUME 1, PART A: DATA BASE TECHNOLOGY FORECASTS
Jun. 1985 429 p refs Revised 6 Vol.
(NASA-TM-88176-Vol-1-Pt-A; NAS 1.15:88176-Vol-1-Pt-A) Avail: NASA Headquarters, Code R CSCL 22B

The sixth edition ofthe NASA Space Systems Technology Model contains a revised format. Three items have been published - a Model document, a Data Base and an Executive Summary. The Data Base consists of material in three areas: Space Technology Trends and Forecasts (vol. 1, parts A and B, of which this is vol. 1, part A), Analysis of Technology Needs (vol. 2) and Mission Payloads (vol. 3). The Trends and Forecasts part contains data characterizing space technology developments and covers 15 topics. The Analysis of Technology Needs consists of summaries of detailed examinations of stated or implied space technology requirements. Mission Payloads presents information on both near and far term missions regarding instruments and experiments for mission systems/programs endorsed by NASA program offices. Author

N86-14293* National Aeronautics and Space Administration, Washington, D.C.
NASA SPACE SYSTEMS TECHNOLOGY MODEL. VOLUME 1, PART B: DATA BASE TECHNOLOGY FORECASTS
Jun. 1985 639 p refs Revised 6 Vol.
(NASA-TM-88176-Vol-1-Pt-B; NAS 1.15:88176-Vol-1-Pt-B) Avail: NASA Headquarters, Code R CSCL 22B

The sixth edition of the NASA Space Systems Technology Model contains a revised format. Three items have been published - a Model document, a Data Base and an Executive Summary. The Data Base consists of material in three areas: Space Technology Trends and Forecasts (vol. 1, parts A and B, of which this is vol. 1, part 3), Analysis of Technology Needs (vol. 2) and Mission Payloads (vol. 3). The Trends and Forecasts part contains data characterizing space technology developments and covers 15 topics. The Analysis of Technology Needs consists of summaries of detailed examinations of stated or implied space technology requirements. Mission Payloads presents information on both near and far term missions regarding instruments and experiments for mission systems/programs endorsed by NASA program offices. Author

N86-14294* National Aeronautics and Space Administration, Washington, D.C.
NASA SPACE SYSTEMS TECHNOLOGY MODEL. VOLUME 2: DATA BASE TECHNOLOGY ANALYSIS
Jun. 1985 498 p refs Revised 6 Vol.
(NASA-TM-88176-Vol-2; NAS 1.15:88176-Vol-2) Avail: NASA Headquarters, Code R CSCL 22B

The sixth edition of the NASA Space Systems Technology Model contains a revised format. Three items have been published - a Model document, a Data Base and an Executive Summary. The Data Base consists of material in three areas: Space Technology Trends and Forecasts (vol. 1, parts A and B), Analysis of Technology Needs (vol. 2 - this volume) and Mission Payloads (vol. 3). The Trends and Forecasts part contains data characterizing space technology developments and covers 15 topics. The Analysis of Technology Needs consists of summaries of detailed examinations of stated or implied space technology requirements. Mission Payloads presents information on both near and far term missions regarding instruments and experiments for mission systems/programs endorsed by NASA program offices. Author

N86-14295* National Aeronautics and Space Administration, Washington, D.C.
NASA SPACE SYSTEMS TECHNOLOGY MODEL. VOLUME 3: DATA BASE FUTURE MISSION PAYLOADS
Jun. 1985 492 p refs Revised 6 Vol.
(NASA-TM-88176-Vol-3; NAS 1.15:88176-Vol-3) Avail: NASA Headquarters, Code R CSCL 22B

The sixth edition of the NASA Space Systems Technology Model contains a revised format. Three items have been published—a Model document, a Data Base and an Executive Summary. The Data Base consists of material in three areas: Space Technology Trends and Forecasts (vol. 1, parts A and B), Analysis of Technology Needs (vol. 2) and Mission Payloads (vol. 3 - this volume). The Trends and Forecasts part contains data characterizing space technology developments and covers 15 topics. The Analysis of Technology Needs consists of summaries of detailed examinations of stated or implied space technology requirements. Mission Payloads presents information on both near and far term missions regarding instruments and experiments for mission systems/programs endorsed by NASA program offices. Author

N86-14296* National Aeronautics and Space Administration, Washington, D.C.
NASA SPACE SYSTEMS TECHNOLOGY MODEL. EXECUTIVE SUMMARY
Jun. 1985 181 p refs 6 Vol.
(NASA-TM-88175; NAS 1.15:88175) Avail: NASA Headquarters, Code R CSCL 22B

The sixth edition of the NASA Space Systems Technology Model contains a revised format. Three items have been published—a Model document, a Data Base and an Executive Summary. The Data Base consists of material in three areas: Space Technology Trends and Forecasts (vol. 1, parts A and B), Analysis of Technology Needs (vol. 2) and Mission Payloads (vol. 3). The Trends and Forecasts part contains data characterizing space technology developments and covers 15 topics. The Analysis of Technology Needs consists of summaries of detailed examinations of stated or implied space technology requirements. Mission Payloads presents information on both near and far term missions regarding instruments and experiments for mission systems/programs endorsed by NASA program offices. This volume, the Executive Summary, presents detailed information selected from the Model document, plus an outline and descriptions of the Data Base material. Author

N86-14297*# City Coll. of the City Univ. of New York. Dept. of Electrical Engineering.
AN ADAPTIVE LEARNING CONTROL SYSTEM FOR LARGE FLEXIBLE STRUCTURES Final Report, 1 Nov. 1979 - 31 Aug. 1984
Frederick E. Thau 1985 43 p refs
(Grant NAG1-6)
(NASA-CR-176422; NAS 1.26:176422) Avail: NTIS HC A03/MF A01 CSCL 22B

The objective of the research has been to study the design of adaptive/learning control systems for the control of large flexible structures. In the first activity an adaptive/learning control methodology for flexible space structures was investigated. The approach was based on using a modal model of the flexible structure dynamics and an output-error identification scheme to identify modal parameters. In the second activity, a least-squares identification scheme was proposed for estimating both modal parameters and modal-to-actuator and modal-to-sensor shape functions. The technique was applied to experimental data obtained from the NASA Langley beam experiment. In the third activity, a separable nonlinear least-squares approach was developed for estimating the number of excited modes, shape functions, modal parameters, and modal amplitude and velocity time functions for a flexible structure. In the final research activity, a dual-adaptive control strategy was developed for regulating the modal dynamics and identifying modal parameters of a flexible structure. A min-max approach was used for finding an input to provide modal parameter identification while not exceeding reasonable bounds on modal displacement. B.W.

N86-14298# Aerospace Corp., El Segundo, Calif. Space Sciences Lab.
A REVIEW OF SCATHA (SPACECRAFT CHARGING AT HIGH ALTITUDES) SATELLITE RESULTS: CHARGING AND DISCHARGING
J. F. Fennell, H. C. Koons, M. S. Leung, and P. F. Mizera 12 Aug. 1985 37 p
(Contract F04701-83-C-0084)
(AD-A158680; TR-0084A(5940-05)-7; SD-TR-85-27) Avail: NTIS HC A03/MF A01 CSCL 22/2

This report summarizes the major results from the SCATHA (P78-2) satellite charging monitors and discharge detectors. The data show that surface charging, near synchronous altitudes, occurs preferentially in the midnight to local morning sectors, as expected. Evidence for bulk charging by energetic electrons is also observed. The material-charging data show that there was a marked increase in bulk conductivity of solar-illuminated Kapton with exposure time in the space vacuum. Teflon accumulated a permanent charge that slowly increased with time, and a quartz cloth material charged to higher than expected levels; some of these material effects have now been simulated in the laboratory. The statistical picture of the surface charging and the resultant discharges and noise generation show a close association with each other. Some of the discharges are ascribed to possible bulk charging. The signal amplitudes of the discharges are discussed and the temporal character of the discharge signal is shown for a few cases. The results represent a new baseline in our understanding of satellite charging and its effects. GRA

N86-14299*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SEU IMMUNE ICS FOR PROJECT GALILEO
A. E. Giddings (Sandia National Labs., Albuquerque, N. Mex.), F. W. Hewlett (Sandia National Labs., Albuquerque, N. Mex.), R. K. Treece (Sandia National Labs., Albuquerque, N. Mex.), D. K. Nichols, L. S. Smith, and J. A. Zoutendyk 1985 11 p refs Presented at the 22nd Annual Conference on Nuclear and Space Radiation Effects, Monterey, California, 22 Jul. 1985
(Contract DE-AC04-76DP-00789; Proj. Galileo)
(DE85-013785; SAND-85-0560C; CONF-850711-9) Avail: NTIS HC A02/MF A01 CSCL 22A

Tests showed that bipolar chips in the attitude control computer of the Galileo spacecraft would likely cause catastrophic mission failure due to single particle upset. This paper describes the design and testing of CMOS replacements which are speed compatible with the bipolar parts and are immune to upset by 165-MeV krypton ions. DOE

N86-14300# National Centre of Tribology, Risley (England). European Space Tribology Lab.
ACCELERATED LIFE TEST OF LEAD ION-PLATED BEARING FOR THE GIOTTO DESPIN MECHANISM
C. C. White Paris ESA Mar. 1985 24 p
(Contract ESTEC-5615/83/NL-PP)
(ESA-ESTL-73; ESA-CR(P)-2074) Avail: NTIS HC A02/MF A01

The ion-plated lead lubrication of the Giotto spacecraft despin mechanism was subjected to an accelerated torque test in vacuum on a pair of angular contact 55 mm ID bearings. A first series of 10 million revolutions was extended by 90 million revolutions (although for Giotto a mission life of 4.5 million is expected). Over 100 million revolutions the torque characteristics of the lead lubricated bearings fall well within the limits set. The 16 rpm torque noise (standard deviation) reaches a maximum of 0.009 Nm (at 80 million revolutions) compared with the limit of 0.12 Nm. The spectral composition of noise over the frequency band of interest is always well below the limits referred to white noise. Although not of direct importance to control stability, the 1 million revolution averaged torques remain in the range 0.0035 to 0.0102 Nm and there is no effect of speed upon average torque. Author (ESA)

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

N86-14301*# Princeton Univ., N. J. Dept. of Astrophysical Sciences.
INTERSTELLAR MEDIUM ABSORPTION PROFILE SPECTROGRAPH (IMAPS) Final Report, 21 Aug. 1980 - 30 Jun. 1985
Edward B. Jenkins 27 Aug. 1985 112 p
(Contract NAS5-26268)
(NASA-CR-176414; NAS 1.26:176414) Avail: NTIS HC A06/MF A01 CSCL 14B

The design and fabrication of an objective-grating echelle spectrograph to fly on sounding rockets and record spectra of stars from approximately 920 to 1120A with a resolving power lambda/delta lambda = 200,000 is discussed. The scientific purpose of the program is to observe, with ten times better velocity resolution than before, the plentiful absorption lines in this spectral region produced by atoms, ions and molecules in

the interstellar medium. In addition, an important technical goal is to develop and flight-quality a new ultraviolet, photon-counting image sensor which has a windowless, opaque photocathode and a CCD bombarded directly by the accelerated photoelectrons. Except for some initial difficulties with the performance of CCDs, the development of the payload instrument is relatively straightforward and our overall design goals are satisfied. The first flight occurred in late 1984, but no data were obtained because of an inrush of air degraded the instrument's vacuum and caused the detector's high voltage to arc. A second flight in early 1985 was a complete success and obtained a spectrum of pi Sco. Data from this mission are currently being reduced; quick-look versions of the spectra indicate that excellent results will be obtained. Currently, the payload is being reconfigured to fly on a Spartan mission in 1988. Author

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N86-14302# National Aerospace Lab., Tokyo (Japan).
PERFORMANCE OF A LOW THRUST STORABLE ENGINE WITH LARGE AREA RATIO NOZZLES
Kazuo Kusaka, Yukio Kuroda, Masahiro Sato, Makoto Tadano, and Shigeyasu Ihara 1985 31 p refs In JAPANESE; ENGLISH summary
(NAL-TR-853; ISSN-0389-4010) Avail: NTIS HC A03/MF A01

High altitude simulation tests of a storable engine with a thrust of 500 N and a chamber pressure of 700 kpa were conducted to evaluate the nozzle performance at low thrust and low chamber pressure. Since the available facility did not allow tests of such an engine, an auxiliary annular ejector/diffuser system was developed. Two injectors, one with 15% fuel film cooling and the other 25%, were used. A comparison of performances between nitrogen tetroxide/monomethyl hydrazine (NTO/MMH) and nitrogen tetroxide propellant systems was made. A vacuum specific impulse of 305 seconds was obtained with NTO/MMH and a 150: 1 area ratio nozzle at a energy release efficiency of 95%. By altering fuel from MMH to hydrazine, a peak specific impulse of 317 seconds was measured with 25% film cooling and a 150 : 1 nozzle. Large area ratio specific impulses can be predicted generally within 0.5% when energy release efficiencies are evaluated from sea level thrust measurements with a low area ratio nozzle. Author

N86-14303# National Aerospace Lab., Tokyo (Japan).
EVALUATION OF COLD ISOSTATIC PRESSING FOR HIGH PRESSURE THRUST CHAMBERS
1985 31 p refs In JAPANESE; ENGLISH summary
(NAL-TR-858; ISSN-0389-4010) Avail: NTIS HC A03/MF A01

The objectives of this program have been to investigate new fabrication methods and design techniques, which potentially reduce fabrication time and cost and also increase rocket thrust chamber life. For these purposes, the authors have developed the CIP (Cold Isostatic Pressing) forming method based on powder metallurgy. With the CIP forming method, a very complaint closeout is easily obtained while sustaining sufficient bonding strength between the copper liner and the closeout, and providing perfect sealing of coolant channels. A metallurgical test was performed before the fabrication of a trial combustion chamber to determine the forming conditions of the sintered closeout which would fulfill the required design conditions. A trial combustion chamber with an OFHC (Oxygen Free High Conductivity) copper liner was then made for a design combustion pressure of 15 MPa and thrust level of 10kN. The combustion tests of the trial combustion chamber were conducted at chamber pressure of up to 9 MPa for 10 runs to confirm the reliability of the CIP formed chamber. Author

N86-14304# Brigham Young Univ., Provo, Utah. Dept. of Chemical Engineering.
MEASUREMENTS OF DISTRIBUTED COMBUSTION Annual Report, Mar. 1983 - Jun. 1984
P. C. Braithwaite and M. W. Beckstead Sep. 1984 60 p
(Grant AF-AFOSR-0157-83)
(AD-A158859; AFOSR-85-0488TR) Avail: NTIS HC A04/MF A01 CSCL 21/8

A modified Rijke burner has been designed and constructed for use in evaluating the influence of particles on acoustic waves. A paddle is used with the burner that can be inserted into the flow field suppressing oscillations on command. Withdrawal of the paddle allows growth of the oscillations. Experimental results obtained using Al and ZrC in the Rijke burner indicate that both additives cause an increase in the acoustic growth rate when compared to growth rates obtained without any particles in the system. The increase caused by Al is greater than that caused by ZrC. Because the reaction of Al releases more than twice the energy ZrC does, it would be expected to have a greater influence on the system than ZrC. The increase in the acoustic growth rate is the result of energy being added to the system by the distributed combustion of the particles. The increase in the acoustic growth rate due to distributed combustion was found to be directly related to the heat of reaction. GRA

N86-14305# Ogden Air Logistics Center, Hill AFB, Utah. Propellant Analysis Lab.
QUALIFICATION OF A NEW MAPO SOURCE AND ERL-510 CURING AGENT FOR MINUTEMAN STAGE 1 UF-2121 LINER Semiannual Report
J. A. Thompson Oct. 1984 25 p
(AD-A159480; MANPA-500(84)) Avail: NTIS HC A02/MF A01 CSCL 19/7

*Tris (1-(2 methyl) aziridinyl) phosphine oxide (MAPO) is used as a curing agent in the Minuteman Stage One UF-2121 liner. Thiokol Chemical Corporation/Wasatch Division uses MAPO in the production of UF-2121 liner. Thiokol changes MAPO vendors and, therefore, qualification of the new source MAPO was required. Thiokol prepared specimens from the new source and also specimens from the original source which are to be used as the control material in the 10 year surveillance testing program. The specimens were transferred to Ogden ALC for testing and reporting of the data obtained. This report includes the quality assurance test results for the first through the ninth time testing of the control and special specimens at Ogden ALC (Air Logistics Center). Statistical analysis of the test data showed that the physical properties of the new source compared closely to the old source of UF-2121 liner specimens. In all instances, the mean data for the control and special specimens are well above the minimum requirements found in TWR-7857 REV A, Thiokol specimen data. Therefore, the capability of the liner from the new source material is expected to perform satisfactorily. GRA

N86-14306# Los Alamos National Lab., N. Mex.
ASSESSMENT OF THE ADVANTAGES AND FEASIBILITY OF A NUCLEAR ROCKET
S. D. Howe 1985 17 p Presented at the Manned Mars Mission Workshop, Huntsville, Alabama, 10 Jun. 1985
(Contract W-7405-eng-36)
(DE85-015717; LA-UR-85-2442) Avail: NTIS HC A02/MF A01

The feasibility of rebuilding and testing a nuclear thermal rocket (NTR) for the Mars mission has been investigated. Calculations indicate that an NTR would substantially reduce the Earth-orbit assembled mass compared to LOX/LH2 systems. The mass savings were 36% and 65% for the cases of total aerobraking and of total propulsive braking respectively. Consequently, the cost savings for a single mission of using an NTR, if aerobraking is feasible, are probably insufficient to warrant the NTR development. If multiple missions are planned or if propulsive braking is desired at Mars and/or at Earth, then the savings of about $7B will easily

pay for the NTR development. Estimates of the cost of rebuilding a NTR were based on the previous NERVA program's budget plus additional costs to develop a flight ready engine. The total cost to build the engine would be between $4 to 5B. The concept of developing a full-power test stand at Johnston Atoll in the Pacific appears very feasible. The added expense of building facilities on the island should be less than $1.4B. DOE

N86-14307# Giessen Univ. (West Germany). First Inst. of Physics.

THE RIT TECHNOLOGY USING XENON AS PROPELLANT Final Report, Jul. 1984

Hans-Werner Velten and Klaus Groh Bonn Bundesministerium fuer Forschung und Technologie May 1985 26 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-W-85-007; ISSN-0170-1339) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 5.50

The applicability of xenon as propellant in the electric ion propulsion system (RIT 10) designed for use with mercury as north-south stationkeeping thruster of stationary satellites is studied because of the mercury toxicity and reactivity. Adaptation and optimization of the RIT 10 ionizer to xenon ionization conditions were required for increased efficiency of the ion propulsion system using the inert xenon. This is achieved with a movable ion extraction guide system allowing ionizer length variations during operation of the thruster. The effects on high frequency power and the total mass effects are studied. It is demonstrated that the optimal ionizer for xenon operation is longer than for mercury operation. This improves efficiency and discharge stability. Author (ESA)

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N86-14308*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

AN AB INITIO INVESTIGATION OF POSSIBLE INTERMEDIATES IN THE REACTION OF THE HYDROXYL AND HYDROPEROXYL RADICALS

Charles F. Jackels (Wake Forest Univ.) 9 Dec. 1985 52 p refs (Contract NCC1-55)

(NASA-TM-87522; NAS 1.15:87522) Avail: NTIS HC A04/MF A01 CSCL 07C

Ab initio quantum chemical techniques are used to investigate covalently-bonded and hydrogen-bonded species that may be important intermediates in the reaction of hydroxyl and hydroperoxyl radicals. Stable structures of both types are identified. Basis sets of polarized double zeta quality and large scale configuration interaction wave functions are utilized. Based on electronic energies, the covalently bonded HOOOH species is 26.4 kcal/mol more stable than the OH and HO2 radicals. Similarly, the hydrogen bonded HO---HO2 species has an electronic energy 4.7 kcal/mol below that of the component radicals, after correction is made for the basis set superposition error. The hydrogen bonded form is planar, possesses one relatively normal hydrogen bond, and has the lowest energy 3A' and 1A' states that are essentially degenerate. The 1A' and 3A' excited states produced by rotation of the unpaired OH electron into the molecular plane are very slightly bound. Author

N86-14309# Ultrasystems, Inc., Irvine, Calif.

SYNTHESES OF NOVEL NITROGEN AND PHOSPHORUS HETEROCYCLES Final Report, 1 Mar. 1982 - 28 Feb. 1985

K. L. Paciorek, J. H. Nakahara, D. H. Harris, M. E. Smythe, and R. H. Kratzer 26 Apr. 1985 62 p

(Contract F49620-82-C-0021)

(AD-A158449; SN-2007-F; AFOSR-85-0500TR) Avail: NTIS HC A04/MF A01 CSCL 07/3

The heterocycles 1-Dichlorophospha-3,5-perfluoro-n-heptyl (or perfluoroalkylether)-2,4,6-tri azines were synthesized by interaction of imidoylamidines with phosphorus pentachloride. In a parallel approach, 1,3-bis(phenylchlorophospha)-5-perfluoroalkyl (or perfluoroalkylether)-2,4,6-triazines were obtained from the reaction of amidines with imido-diphenyl-diphosphinic acid pentachloride. Replacement of chlorine by thiophenyl and azido groups proceeded readily. Di-(phenylchlorophospha)-s-triazine was found to undergo further reaction with amidine in a 1:2 ratio. The existence of stereo-isomerism was indicated. The thiophenyl-substituted phospha-s-triazines functioned as corrosion and oxidation inhibitors in perfluoroalkylether fluids; however, their thermal and thermal oxidative stability was lower than that of the phenyl analogues. Both the mono and diphospha-s-triazines were completely degraded in 24 hr at 316 C in nitrogen; diphenylsulfide was one of the major products. Mass spectral analysis of the phenyl-free phospha-s-triazines revealed that the specific breakdown patterns are ring specific not phenyl-substituent dependent. Perfluoro-n-octanonitrile was found to react with aniline both in the absence and presence of solvents. Treatment of perfluoro-n-octanonitrile with phenylphosphine gave tetraphenyltetraphosphine and a spectrum of reduction and interaction products of perfluorooctanonitriles, as well as phenylphosphine addition compounds. GRA

N86-14310# Harvard Univ., Cambridge, Mass. Dept. of Chemistry.

ACID-BASE BEHAVIOR OF CARBOXYLIC ACID GROUPS COVALENTLY ATTACHED AT THE SURFACE OF POLYETHYLENE: THE USEFULNESS OF CONTACT ANGLE IN FOLLOWING THE IONIZATION OF SURFACE FUNCTIONALITY

S. R. Holmes-Farley, R. H. Reamey, T. J. McCarthy, J. Deutch, and G. M. Whitesides Aug. 1985 68 p

(Contract N00014-83-K-142)

(AD-A158596; TR-85-1) Avail: NTIS HC A04/MF A01 CSCL 07/4

Oxidation of polyethylene with chromic acid/sulfuric acid generates a material (PE-CO2H) having a high density of carboxylic acid and ketone functionalities in a thin surface layer on the surface and near-surface carboxylic acid groups of these materials in contact with water as a function of pH using three experimental techniques: measurement of attenuated total reflectance infrared techniques: measurement of attenuated total reflectance infrared (ATR-IR) spectra, measurement of contact angles, and direct potentiometric titration. On the basis of correlations between results obtained using these three techniques, we propose an equation relating the contact angles an aqueous solution having a given value of pH and the extent of ionization (a subscript i) of those carboxylic acid groups that are directly exposed to the solution. These carboxylic acid groups have broad titration curves, and have CO2H groups that are less acidic than soluble carboxylic acids. The initial ionization of these carboxylic acid groups occurs when the solution is approximately pH = 6. The detailed structures of these oxidized polymer surface layers and the nature of the interactions between the carboxylic acid and carboxylate ions in them are still not completely defined. Salt effects on the extent of ionization a subscript i at a particular value of pH are unexpectedly small, and suggest that charge-charge interactions between carboxylate ions may not dominate the titration curves. This work demonstrates the usefulness of contact angle in following chemical changes occurring in organic functional groups of surfaces. GRA

N86-14311# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.

QUANTITATIVE DETERMINATION OF HYDROCARBON GROUP-TYPES VIA HIGH PERFORMANCE LIQUID CHROMATOGRAPHY WITH DIELECTRIC CONSTANT DETECTION Final Report, Mar. 1984 - Mar. 1985

P. C. Hayes, Jr. and S. D. Anderson Jul. 1985 57 p

(AF Proj. 3048)

(AD-A158695; AFWAL-TR-85-2028) Avail: NTIS HC A04/MF A01 CSCL 07/4

A dielectric constant (DC) detector for high performance liquid chromatography (HPLC) is the basis of an accurate and versatile hydrocarbon group-type analysis of petroleum-and shale-derived distillate fuels. The method can saturate (+ olefins), alkyl benzenes, and polycyclic aromatics in hydrocarbon liquids below 600 C. The HPLC separation is achieved with three columns in series, i.e., two five micrometer Partisil PAC columns preceding a 10 micrometer TENF column, and using n-butyl chloride as the mobile phase. A simple three-component standard mixture is all that is required to calibrate the method. The DC detector ensures a genuine uniformity of response (less than 2.5% RSD) for each hydrocarbon group-type independent of the carbon-number distribution of the sample. Based on simple and complex hydrocarbon standard solutions, the accuracy for each structural group-type is within 2% absolute with a chromatographic limit of detection of approximately 150 ng for a late eluting solute (biphenyl). GRA

N86-14312# California Univ., Berkeley. Lawrence Berkeley Lab.
SELECTIVE HYDROGENATION OF POLYNUCLEAR HETEROATOMIC COMPOUNDS Final Report
R. H. Fish and H. Heinemann Aug. 1985 41 p
(Contract DE-AC03-76SF-00098)
(DE85-017581; EPRI-AP-4227) Avail: NTIS HC A03/MF A01

This research program focused on the utilization of polymer-supported (polystyrene-divinylbenzene, PS-DVB) transition-metal catalysts in the selective catalytic hydrogenation of polynuclear heteroaromatic compounds that are known to be present in coal and coal liquids. We found that the polymer-supported chlorotris (triphenyl-phosphine)rhodium(1) was the most efficient catalyst for the regiospecific reduction of the nitrogen-containing ring in model-coal compounds such as quinoline, 5,6- and 7,8-benzoquinoline and acridine, and in one case, a heteroaromatic sulfur compound, benzothiophene. Interestingly, the polymer-supported rhodium catalyst was more active than the corresponding homogeneous analogue by relative rate factors of 10 to 20 depending on the substrate studied in the reduction. More importantly, a model coal liquid was found to have a relative rate of reduction of quinoline to 1,2,3,4-tetrahydroquinoline (THQ) that was 2.2 times faster than a similar experiment without the coal liquid constituents consisting of pyrene, tetralin, methylnaphthalene, p-cresol, quinoline, and 2-methylpyridine. Further experimentation clearly showed that the model coal liquid constituent, p-cresol, was responsible for the relative rate enhancement in the highly regiospecific (no other model coal liquid constituent was hydrogenated) reduction of quinoline to THQ. We also found that 9,10-dihydrophenanthridine was an excellent catalytic transfer hydrogenation reagent in the presence of several homogeneous and polymer-supported transition-metal catalysts. A discussion demonstrates the potential usefulness of these catalysts in the hydroprocessing of coal liquids and other petroleum products. DOE

N86-14313# Centre Technique des Industries Mecaniques, Senlis (France).
INFLUENCE OF METHANOL ADDITIVES ON THE ATMOSPHERES OBTAINED FROM NITROGEN AND METHANOL Final Report [INFLUENCE DES DENATURANTS DU METHANOL SUR LES ATMOSPHERES OBTENUES A PARTIR D'AZOTE ET DE METHANOL]
D. Ghiglione Aug. 1984 83 p refs In FRENCH
(CETIM-101-160) Avail: NTIS HC A05/MF A01

The carburizing procedure using an atmosphere composed of 40% nitrogen 60% methanol was investigated to determine the influence of the methanol additives required by law in France. The chemical composition, the carbonizing potential and the carbonizing results were studied. The conclusions are that the use of methanol with additives does not affect industrial application, but reduces slightly the theoretical carburizing potential. The exact determination of this reduction requires more experimental data. Author (ESA)

24 COMPOSITE MATERIALS

Includes laminates.

N86-14314*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
FAILURE MECHANISMS OF LAMINATES TRANSVERSELY LOADED BY BOLT PUSH-THROUGH
William A. Waters, Jr. (Kentron International Inc., Hampton, Va.) and Jerry G. Williams Sep. 1985 26 p refs
(NASA-TM-87603; NAS 1.15:87603) Avail: NTIS HC A03/MF A01 CSCL 11D

Stiffened composite panels proposed for fuselage and wing design utilize a variety of stiffener-to-skin attachment concepts including mechanical fasteners. The attachment concept is an important factor influencing the panel's strength and can govern its performance following local damage. Mechanical fasteners can be an effective method for preventing stiffener-skin separation. One potential failure mode for bolted panels occurs when the bolts pull through the stiffener attachment flange or skin. The resulting loss of support by the skin to the stiffener and by the stiffener to the skin can result in local buckling and subsequent panel collapse. The characteristic failure modes associated with bolt push-through failure are described and the results of a parametric study of the effects that different material systems, boundary conditions, and laminates have on the forces and displacements required to cause damage and bolt pushthrough failure are presented. Author

N86-14315*# Delaware Univ., Newark. Center for Composite Materials.
DELAMINATION GROWTH IN COMPOSITE MATERIALS Final Report
John W. Gillespie, Jr., Leif A. Carlson, R. Byron Pipes, Robert Rothschilds, Bruce Trethewey, and Anthony Smiley 16 Dec. 1985 213 p refs
(Grant NAG1-475)
(NASA-CR-176416; NAS 1.26:176416) Avail: NTIS HC A10/MF A01 CSCL 11D

Research related to growth of an imbedded through-width delamination (ITWD) in a compression loaded composite structural element is presented. Composites with widely different interlaminar fracture resistance were examined, viz., graphite/epoxy (CYCOM 982) and graphite/PEEK (APC-2). The initial part of the program consisted of characterizing the material in tension, compression and shear mainly to obtain consistent material properties for analysis, but also as a check of the processing method developed for the thermoplastic APC-2 material. The characterization of the delamination growth in the ITWD specimen, which for the unidirectional case is essentially a mixed Mode 1 and 2 geometry, requires verified mixed-mode growth criteria for the two materials involved. For this purpose the main emphasis during this part of the investigation was on Mode 1 and 2 fracture specimens, namely the Double Cantilever Beam (DCB) and End Notched Flexure (ENF) specimens. Author

N86-14316*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INTERLAMINAR FRACTURE TOUGHNESS: THREE-DIMENSIONAL FINITE ELEMENT MODELING FOR END-NOTCH AND MIXED-MODE FLEXURE
P. L. N. Murthy and C. C. Chamis [1985] 28 p refs Presented at the Symposium on Toughened Composites, Houston, Texas, 13-15 March 1985; sponsored by the American Society for Testing and Materials
(NASA-TM-87138; E-2626; NAS 1.15:87138) Avail: NTIS HC A03/MF A01 CSCL 11D

A computational procedure is described for evaluating End-Notch-Flexure (ENF) and Mixed-Mode-Flexure (MMF) interlaminar fracture toughness in unidirectional fiber composites. The procedure consists of a three-dimensional finite element analysis in conjunction with the strain energy release rate concept and with composite micromechanics. The procedure is used to analyze select

cases of ENF and MMF. The strain energy release rate predicted by this procedure is in good agreement with limited experimental data. The procedure is used to identify significant parameters associated with interlaminar fracture toughness. It is also used to determine the critical strain energy release rate and its attendant crack length in ENF and/or MMF. This computational procedure has considerable versatility/generality and provides extensive information about interlaminar fracture toughness in fiber composites. Author

N86-14317*# Lockheed-California Co., Burbank.
FLIGHT SERVICE EVALUATION OF ADVANCED COMPOSITE AILERONS ON THE L-1011 TRANSPORT AIRCRAFT Annual Flight Service Report, Jul. 1984 - Jun. 1985
R. H. Stone Jul. 1985 10 p refs
(Contract NAS1-15069)
(NASA-CR-177960; NAS 1.26:177960; LR-30904; AFSR-3) Avail: NTIS HC A02/MF A01 CSCL 11D

Flight service evaluation of composite inboard ailerons on the L-1011 under Contract NAS 1-15069 for a period of five years is discussed. The period from July 1984, when the second yearly inspections were completed, through June 1985 is covered. Four shipsets of graphite/epoxy composite inboard ailerons were installed on L-1011 aircraft for this maintenance evaluation program. These include two Delta aircraft and two TWA aircraft. A fifth shipset of composite ailerons were installed in 1980 on Lockheed's flight test L-1011. This aircraft is now inactive and inspections were therefore not performed this year. No visible damage was observed on any of the composite ailerons, and no maintenance action has occurred on any of the composite parts except for repainting of areas with paint loss. Flight hours on the airline components at the time of inspection ranged from 8787 to 10,804 hours, after approximately 3 years of service. Author

N86-14318*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Composite Materials and Structures.
FATIGUE DAMAGE IN NOTCHED COMPOSITE LAMINATES UNDER TENSION-TENSION CYCLIC LOADS Final Report
W. W. Stinchcomb, E. G. Henneke, K. L. Reifsnider, and G. R. Kress (DFVLR, Braunschweig, West Germany) Sep. 1985 119 p refs
(Grant NAG1-232)
(NASA-CR-176412; NAS 1.26:176412; CCMS-85-12) Avail: NTIS HC A06/MF A01 CSCL 11D

The results are given of an investigation to determine the damage states which develop in graphite epoxy laminates with center holes due to tension-tension cyclic loads, to determine the influence of stacking sequence on the initiation and interaction of damage modes and the process of damage development, and to establish the relationships between the damage states and the strength, stiffness, and life of the laminates. Two quasi-isotropic laminates were selected to give different distributions of interlaminar stresses around the hole. The laminates were tested under cyclic loads (R=0.1, 10 Hz) at maximum stresses ranging between 60 and 95 percent of the notched tensile strength. Author

N86-14319# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Strukturmechanik.
MATERIAL SELECTION FOR CARBON FIBER REINFORCED COMPOSITE STRUCTURES
Jun. 1985 188 p refs In GERMAN; ENGLISH summary Presented at Strukturmech.-Kolloq., Brunswick, West Germany, 19 Jun. 1985 Report will also be announced as translation (ESA-TT-950)
(DFVLR-Mitt-85-09; ISSN-0176-7739) Avail: NTIS HC A09/MF A01; DFVLR, Cologne DM 50

Composite structures for light constructions; influence of environmental conditions on carbon fiber reinforced plastics; carbon fiber reinforced plastic strength, and reaction to humidity and temperature; resin selection for application of specific carbon fiber types; fiber resin interface (chemical analysis); and the influence of various parameters on the microscopic fractograph of carbon fiber tensile test specimens were discussed. For individual titles, see N86-14320 through N86-14325.

N86-14320# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Strukturmechanik.
ADVANCED COMPOSITES FOR LIGHTWEIGHT STRUCTURES
Guenter Niederstadt *In its* Mater. Selection for Carbon Fiber Reinforced Composite Struct. Jun. 1985 p 9-23 In GERMAN; ENGLISH summary (For primary document see N86-14319 05-24)
Avail: NTIS HC A09/MF A01; DFVLR, Cologne DM 50

The mechanical properties of composite structures were investigated regarding weight reduction for light construction, especially strength, stiffness and fracture strain behavior. Stress-strain diagrams for different composite structures are studied to obtain optimal fiber and resin matrix combinations with modified matrix ductility and data on the influence of environmental conditions on the composite structures. The time-dependent stress-strain behavior of conventional resin matrix composites can be described with isochronous stress-stress curves and depends on humidity, temperature and solar radiation. Author (ESA)

N86-14321# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Strukturemechanik.
INFLUENCES OF ENVIRONMENTAL CONDITIONS ON CARBON FIBER REINFORCED PLASTICS
Guenter Niederstadt *In its* Mater. Selection for Carbon Fiber Reinforced Composite Struct. Jun. 1985 p 25-48 refs In GERMAN; ENGLISH summary (For primary document see N86-14319 05-24)
Avail: NTIS HC A09/MF A01; DFVLR, Cologne DM 50

Responses of fiber and resin matrix in carbon fiber reinforced fibers to humidity, temperature, and solar radiation were studied. Responses to humidity include loss of mechanical properties (fracture strength and elasticity, deformability of the plastics) plus matrix swelling. Increased fracture strain leads to improved ductility of specific resin matrix systems. Responses to temperature rise include increased fracture strain, reduced strength and stiffness for plastics, and matrix thermal expansion. Responses to solar radiation include reduced molecular weight and mechanical strength, stress corrosion cracking for plastics, and matrix aging swelling. Coating of the carbon fiber structure surface with glass fibers or pure resin matrix systems is recommended to avoid strain corrosion due to the glass fiber laminate response to radiation.
Author (ESA)

N86-14322# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Strukturmechanik.
CARBON FIBER REINFORCED PLASTICS RESPONSES TO HUMIDITY AND TEMPERATURE
Michael Gaedke *In its* Mater. Selection for Carbon Fiber Reinforced Composite Struct. Jun. 1985 p 49-97 refs In GERMAN; ENGLISH summary (For primary document see N86-14319 05-24)
Avail: NTIS HC A09/MF A01; DFVLR, Cologne DM 50

The analytical prediction of material properties of multidirectional laminates at high or low temperatures in a matrix wet and dry state is discussed. The prediction is based on proven methods used for experimental determination of unidirectional ply properties. Prediction applicability is verified with results from tests on multidirectional laminates. The prediction and fiber composite material strength depend on the sorption and temperature-dependent internal stress. Author (ESA)

N86-14323# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Strukturmechanik.
RESIN SELECTION FOR APPLICATION OF SPECIFIC CARBON FIBER TYPES
Harald Twardy and Joachim Block *In its* Mater. Selection for Carbon Fiber Reinforced Composite Struct. Jun. 1985 p 99-129 In GERMAN; ENGLISH summary (For primary document see

N86-14319 05-24)
Avail: NTIS HC A09/MF A01; DFVLR, Cologne DM 50

The effects of resin failure strain and of three different carbon fiber types on composite material behavior under tension load using rings were studied for crack-free laminate production. Measures using the acoustic energy method to detect fracture risk values confirm the influence of a flexible resin matrix on fracture occurrence. Yield limit points are determined for composite materials made of ST-3 and T-300 fibers. The effects of the matrix fracture propagation on the composite strength are studied. Further investigation of the applicability of high performance fibers with stretchable matrix resin is recommended. Author (ESA)

N86-14324# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Strukturmechanik.

THE INTERFACE BETWEEN FIBER AND MATRIX RESIN FROM A CHEMICAL POINT OF VIEW

Hartmut Greulich *In its* Mater. Selection for Carbon Fiber Reinforced Composite Struct. Jun. 1985 p 131-156; DFVLR, Cologne DM 50 refs In GERMAN; ENGLISH summary (For primary document see N86-14319 05-24)
Avail: NTIS HC A09/MF A01

The interface between fiber and resin was investigated for crack prevention along the fiber surface and composite early failure prevention due to a bad force transfer between fiber and resin consecutive to bad adhesion. Adhesion depends on the number of reactive carbonyl and carboxyl groups on the fiber surface and on the fiber preimpregnation with resin for reaction activation. A sizing material serves as an adhesion intermediate between fiber and resin. The structure of the sizing materials at the surface of commercial carbon fibers was examined using Auger electron spectroscopy and chromatographic methods. Electrochemical oxidation used to remove or modify the sizing material is recommended for an improved fiber integration to the resin matrix. The relationship between removed sizing degree and improved fiber-resin adhesion is studied by measuring the interlaminar shear strength on unidirectional short bending test specimens and assessing the first ply failure point on tensile test specimens. A continued sizing removal appliance based on the results is developed. Author (ESA)

N86-14325# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Strukturmechanik.

INFLUENCE OF VARIOUS PARAMETERS ON THE MICROSCOPIC APPEARANCE OF FRACTURE OF CARBON FIBER

Paul Nitsch *In its* Mater. Selection for Carbon Fiber Reinforced Composite Struct. Jun. 1985 p 157-184 refs In GERMAN; ENGLISH summary (For primary document see N86-14319 05-24)
Avail: NTIS HC A09/MF A01; DFVLR, Cologne DM 50

The effects of water intake in the matrix, hardening and thermal cycling, temperature rise during loading, and increased resin ductility on the microscopic fractograph of carbon fiber reinforced plastics and pure epoxy resin under tension load are investigated regarding individual fiber fracture, adhesion failure, and microcrack formation in the matrix using a scanning electron microscope. Fiber/resin adhesion depends on the temperature and humidity content. Quantification of the fiber/resin adhesion with the mean fiber extension length shows a correlation with the residual tensile strength. Author (ESA)

N86-14326# Middle East Technical Univ., Ankara (Turkey). Dept. of Metallurgical Engineering.

EFFECT OF POST CURING PROCESS ON THE PROPERTIES OF GRAPHITE/EPOXY COMPOSITES Final Report, 15 Sep. 1983 - 14 Sep. 1984

A. Ankara 14 Jun. 1985 32 p
(Grant AF-AFOSR-0284-83)
(AD-A157690; EOARD-TR-85-08; SR-1) Avail: NTIS HC A03/MF A01 CSCL 11/4

The objective of the study was to investigate the effect of post-cure on the moisture absorption and dynamic response of CFRP. The unidirectional materials were postcured in the range of 190 to 210 C for times up to 10 hrs. The dynamic response was measured by torsion pendulum technique and the interlaminar shear strength at room temperature and 120 C in short beam bending. The interlaminar shear strength and the glass transition temperature of the composite in wet condition was found to be governed by the amount of absorbed moisture. The different post-curing conditions did not cause a change in the mechanical behavior of the Fibredux 914C/T300 composite. The results are explained in terms of cross-linking density of the cured epoxy. GRA

N86-14327# Rockwell International Science Center, Thousand Oaks, Calif. Science Center.

EVALUATION OF NEW RESIN SYSTEMS Final Report, 20 Sep. 1982 - 20 Jan. 1985

P. J. Dynes May 1985 141 p
(Contract F33615-82-C-5064)
(AD-A158648; SC5338.85FR; AFWAL-TR-85-4053) Avail: NTIS HC A07/MF A01 CSCL 11/4

Four new acetylene terminated resins were evaluated as matrix materials for advanced aerospace composites. They were Hughes HR600P and three Air Force developed resins including BATQ-H(ATP), ATB and m-ATS. Given one pound of each of the materials, neat resin tensile properties were first studied to determine the optimum cure cycle and service temperature capability. Graphite prepreg was prepared using a single tow hot-melt prepregger. Small unidirectional laminates were then fabricated and baseline mechanical properties generated for varying temperature conditions for both dry and moisture conditioned states. The following tasks were accomplished: differential scanning calorimetry, thermogravimetric analysis and rheometrics cure rheological analysis were performed on the four candidate resins. Neat resin microtensile specimens of HR600P, BATQ-H(ATP) and ATB were prepared and tested to determine the optimum postcure cycle for these materials. AS4/BATQ-H(ATP), AS4/ATB and AS4/m-ATS prepreg were prepared with a laboratory hot-melt prepregger. High quality laminates of AS4/ATB and AS4/m-ATS were prepared with the no bag autoclave technique. Void free laminates of AS4/BATQ-H(ATP) were prepared by press molding. Interlaminar shear, flexure, transverse flexure and G subscript 1c composite mechanical tests were performed. Physical property evaluations included prepreg resin content, cured laminate resin content, void evaluation and Tg (rheometrics). Interlaminar shear and G subscript 1c delamination failure surfaces were analyzed by SEM. Author (GRA)

N86-14328# Northwestern Univ., Evanston, Ill. Dept. of Materials Science.

THE MEASUREMENT OF STRESSES IN COMPOSITES

J. B. Cohen Aug. 1985 37 p
(Contract N00014-80-C-0116)
(AD-A158938; TR-21) Avail: NTIS HC A03/MF A01 CSCL 11/4

Although there is mounting interest in the measurement of stresses in composite materials after fabrication and/or use, few measurements to date have taken into account the three dimensional nature of the stress system in such materials. Most data gives only the net stress, that is the difference between principal stresses. This report develops a procedure for a more complete measurement (in a reasonable time), including the separation of macrostresses and microstresses. If time does not permit a full investigation, measurements of the lattice parameters of the component phases provide a simple way to sample the hydrostatic component due to differential thermal contraction. The Barrett Predecki method of adding filter is particularly promising for stress measurements in those composites whose component phases do not give appropriate diffraction peaks. This procedure could also be used for monitoring stresses during the useful life of such materials. GRA

N86-14329# Fraunhofer Inst. fuer Werkstoffmechanik, Freiburg (West Germany).

ABRASION AND STRENGTH OF QUARTZ-FILLED COMPOSITE MATERIALS AFTER AGING AND THERMAL SHOCK TREATMENT [ABRASIONS- UND FESTIGKEITSVERHALTEN VON QUARZGEFUELLTEN KOMPOSITEN NACH ALTERUNG UND TEMPERATURSCHOCKBEHANDLUNG]

W. Butz, U. Soltesz, and B. Klaiber Jan. 1984 60 p refs In GERMAN

(Rept-W-1/84) Avail: NTIS HC A04/MF A01

Four composite materials differing in the size of the quartz used as a filling material were tested for 9 months to study their abrasion resistance to brush wear as well as their bending and compressive strength for application in dentistry by simulating physiological environmental conditions. The effects of aging and water intake were analyzed, and the materials were exposed to the thermal cycling process. Time and thermal cycling processes can modify the mechanical strength behavior and the abrasion resistance of the composite materials. Author (ESA)

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N86-14330# Sandia National Labs., Albuquerque, N. Mex. Severe Accident Containment Response Div.

TOTAL NORMAL EMITTANCE MEASUREMENTS OF HIGHLY CONDUCTIVE, OPAQUE MATERIALS USING A SOLAR FURNACE

Billy W. Marshall, Jr., George P. Mulholland (New Mexico State Univ.), and Robert M. Edgar Oct. 1984 74 p refs

(Contract DE-AC04-76DP-00789)

(SAND-84-0237) Avail: NTIS HC A04/MF A01

This report presents a method for measuring the total normal emittance of a conductive opaque material with and without a selective surface coating and at elevated temperatures. The purpose was to develop a method for measuring surface properties of materials subjected to highly concentrated solar flux. A horizontal axis solar furnace was used to heat the samples to temperatures ranging from 373 to 973 K (100 to 700 C), with all tests conducted in air. A Kendall MK-VI radiometer consisting of a cavity-type radiometer and a control unit was used to measure the total normal emittance. The emittance measurements for both copper and aluminum at 373 and 473 K (100 and 200 C) were found to be unreliable because of relatively high drift in the cavity-type radiometer system compared to the emitted energy at these temperatures. However, total normal emittance measurements of these materials at 573 K (300 C) and above compare favorably with trends of published data. Author

N86-14331*# Drexel Univ., Philadelphia, Pa. Dept. of Mechanical Engineering and Mechanics.

TRANSITION REGION IGNITION CHARACTERISTICS OF n-HEPTANE SPRAYS

A. M. Danis, N. P. Cernansky, and I. Namer [Apr. 1985] 24 p refs Presented at the Joint Western and Central States Section Combustion Institute Meeting, San Antonio, Texas, 22-23 Apr. 1985

(Grant NAG3-382)

(NASA-CR-176346; NAS 1.26:176346; WS/CSCI-85-1-6B) Avail: NTIS HC A02/MF A01 CSCL 21B

Ignition studies were perferred on monodisperse n-heptane sprays at atmospheric pressure over a range of equivalence ratios and droplet diameters. A capacitive discharge spark ignition system was used as the ignition source, providing independent control of spark energy and duration. Preliminary measurements were made to optimize spark duration and spark gap, optimum conditions being those at which the maximum frequency or probability of ignition was observed. The effect of spark duration on ignition frequency for several spark energies was determined for equivalence ratios of 0.5 and 1.0 and initial droplet diameters of 28 and 68 microns. Spark duration had little effect on ignition frequency over the entire 15 to 170 mu s range examined. Spark durations of 70 to 80 mu s were used for all subsequent work. The spark gap was optimized at equivalence ratios of 0.6, 0.8 and 1.0 and initial droplet diameters of 30, 40, 50, 60 and 70 microns by varying the electrode spacing from 0.5 to 5.0 mm while maintaining a constant spark energy. The optimum gap was determined to be 3.0 mm for nearly all conditions. Author

N86-14332# Michigan Univ., Ann Arbor. Dept. of Chemistry.

DISTIBINES, NEW ONE-DIMENSIONAL MATERIALS Final Report, 1 Jun. 1981 - 31 Mar. 1985

A. J. Ashe, III 17 May 1985 11 p

(Grant AF-AFOSR-0009-81)

(AD-A158534; AFOSR-85-0502TR) Avail: NTIS HC A02/MF A01 CSCL 07/3

A large number of novel diarsines, distibines and dibismuthines have been prepared. It has been shown that thermochromic distibines and presumably the corresponding dibismuthines show a solid-phase association which is responsible for the intense color of their solid state. Dibismuthines react with a variety of reagents. The products invariably involve cleavage of the metal-metal bond. A new general synthesis of C-unsubstituted heteroles has been developed. Author (GRA)

N86-14333# SRI International Corp., Menlo Park, Calif.

REACTION OF SUPEROXIDE RADICAL ANION WITH PENTACOVALENT PHOSPHORUS ESTERS Final Report, 1982 - 1985

A. Kwan, R. A. Kenley, J. S. Winterle, and T. Mill 30 May 1985 83 p

(Contract DAAG29-82-K-0134)

(AD-A158564; ARO-19265.1-CH) Avail: NTIS HC A05/MF A01 CSCL 07/5

We found that O2 rapidly reacts with organosulfur compounds; thus, we concluded that the photosensitized process could be used for catalytically decontaminating mustard (ClCH2-CH2SCH2CH2Cl). Because various photosensitizers are known to react with molecular oxygen to produce superoxide radical anion, O2-, we briefly investigated reactions of O2-, with an organophosphorus ester. We found that O2- in dimethylsulfoxide (DMSO) solution rapidly destroys (C2H5O)CH3P(O)SC2H5, thus raising the possibility that photochemical methods could form the basis for decontaminating chemical warfare nerve agents. This report summarizes the findings of a two-year project to study the reactions of superoxide (O2-) with pentacovalent phosphorus esters (P-esters). Reaction of superoxide ion (O2-) in DMSO with phosphorus esters leads to complex kinetics and products in the cases of triphenyl and tris p-nitro-phenyl phosphate. Reactivities of these and other esters with O2- ion are about 4 to 12 times larger than with HO- or RO-. Ipso attack on aromatic carbon rather than on phosphorus appears to be the dominant mode of reaction of O2- with aromatic esters. GRA

N86-14334# Dayton Univ., Ohio. Research Inst.

ASPECTS OF HIGH-RESOLUTION GAS CHROMATOGRAPHY AS APPLIED TO THE ANALYSIS OF HYDROCARBON FUELS AND OTHER COMPLEX ORGANIC MIXTURES. VOLUME 2: SURVEY OF SAMPLE INSERTION TECHNIQUES Final Report, Jan. - Sep. 1980

W. A. Rubey and W. E. Dirkes, Jr. Jun. 1985 48 p

(Contract F33615-77-C-2004)

(AD-A158772; UDR-TR-83-97-Vol-2; AFWAL-TR-84-2096-Vol-2) Avail: NTIS HC A03/MF A01 CSCL 21/4

Special attention needs to be given to the sample injection process in high-resolution gas chromatography (HRGC). For the analysis of highly complex organic mixtures, such as turbine engine fuels and various hydrocarbon feed stocks, the sample insertion process is especially important. Presently, it is this admitting of sample to an HRGC system which most seriously limits the chromatographic analysis. Many different procedures have been used for injecting samples into an open tubular column gas

chromatographic with the use of microliter syringes. These many procedures can be grouped into four classifications known as: the split, the direct, the splitless, and the on-column injection procedure, respectively. These four types of injection procedures have been surveyed and evaluated with respect to idealized injection practice, solute overloading, use of injector inserts and precolumns, fast injection procedures, and various methods for focusing inserted solute zones. In view of the importance of sample insertion in HRGC, improved sample insertion procedures are under development. Also, recommendations are presented for obtaining adequate insertion of highly complex and undiluted hydrocarbon mixtures with HRGC systems. GRA

N86-14335# Reading Univ. (England).
THE 7TH INTERNATIONAL SYMPOSIUM ON SOLUTE-SOLUTE-SOLVENT INTERACTIONS HELD AT READING, ENGLAND ON 15-19 JULY 1985
19 Jul. 1985 176 p Symp. held at Reading, England, 15-17 Jul. 1985
(Contract DAJA45-85-M-0181)
(AD-A158830; R/D-5028-CH-02) Avail: NTIS HC A09/MF A01 CSCL 07/4

Themes presented at the 7th International symposium on solute-solute-solvent interactions include the following: the physical chemistry of natural waters; chemical speciation in natural waters - a cautionary tale; ionic hydration by neutron scattering; molecular dynamic simulations of aqueous electrolyte solutions; theoretical studies of aqueous solution structure; local order due to electrostatic interactions; aqueous mixtures to supercritical temperatures and at high pressures; solvent effects on reaction rates; theories of transport properties using the onsager treatment; data on transport properties of electrolyte solutions for applied research and technology; insiguts into solute-solute-solvent interactions from transport property measurements with particular reference to methanol-water mixtures and their constituents; ionic interactions in aqueous mixtures of hydrochloric acid with divalent metal chlorides; fundamental and applied aspects of naturally-occurring electrolyte solutions (natural waters, brines, etc.); structural determination of the properties of liquids and solutions (molecular dynamics, scattering studies, Monte Carlo methods and spectroscopic studies); reaction equilibria and dynamics in solution; transport properties of fluids (conductivity, viscosity, diffusion etc.); and thermodynamic properties. GRA

N86-14336# Massachusetts Inst. of Tech., Cambridge. Dept. of Chemistry.
POLY-3-METHYLTHIOPHENE COATED ELECTRODES: OPTICAL AND ELECTRICAL PROPERTIES AS A FUNCTION OF REDOX POTENTIAL AND AMPLIFICATION OF ELECTRICAL AND CHEMICAL SIGNALS USING POLY-3-METHYLTHIOPHENE-BASED MICROELECTROCHEMICAL TRANSISTORS Interim Technical Report
J. W. Thackeray, H. S. White, and M. S. Wrighton 15 Aug. 1985 36 p
(Contract N00014-84-K-0291)
(AD-A158854; ONR-TR-6) Avail: NTIS HC A03/MF A01 CSCL 09/1

Optical and electrical properties of anodically grown poly-3-methythiophene are reported as a function of redox potential in CH3CN/0.1M (n-Bu4N)ClO4. Poly-3-methylthiophene can be grown by the oxidation of 3-methylthiophene and deposited onto Au or Pt electrode surfaces. A pair of poly-3-methylthiophene-connected microelectrodes can function as a transistor where one of the electrodes is regarded as source and the other as drain with the source being referenced to the solution as a gate. The poly-3-methylthiophene is the analogue of the channel of a solid state field effect transistor, since its conductivity changes by > 100,000,000 depending on the potential. Large optical (300 to 800 nm) and electrical changes for the poly-3-methylthiophene occur between approx. +0.3 V and approx. +0.8 V vs. SCE. The reduced material has an absorption maximum at 490 nm and the oxidized material has an absorption maximum at 750 nm. The optical density changes parallel the resistant changes that occur as the potential of the polymer changes between approx. +0.3 and approx. +0.8 V vs. SCE. The charging of a 1.5 micrometer thick film of poly-3-methylthiophene involves approx. 10,000 times more charge per unit of projected area then a smooth Pt electrode, consistent with a large effective internal surface area for the conducting polymer. GRA

N86-14337# Chicago Univ., Ill.
EXTENSIONS OF THE FIELD EMISSION FLUCTUATION METHOD FOR THE DETERMINATION OF SURFACE DIFFUSION COEFFICIENTS
R. Gomer Jul. 1985 24 p
(Contract N00014-77-C-0018)
(AD-A159028) Avail: NTIS HC A02/MF A01 CSCL 07/4

The use of scanning tunneling microscopy and related techniques for the determination of surface diffusion coefficients of adsorbates is discussed. Three schemes, all extensions of the field emission current fluctuation method are presented and analyzed. The first consists of determining single site correlation functions with a STM in its more or less normal operating mode. The second consists of retracting the tip approximately one tip radius so that a circular region of high field is created on the flat surface from which field emission and diffusion induced current fluctuations can be obtained. The third considers creation of a long narrow region of high field by placing a very fine cylindrical wire parallel to and above the plane substrate. This last scheme allows determination of diffusion anisotropy. Detailed expressions for the current correlation functions for the three schemes should be feasible but probably would differ in the range of diffusion coefficient values they would be able to handle. Author (GRA)

N86-14338# Naval Postgraduate School, Monterey, Calif.
EXPERIMENTAL INVESTIGATION OF ALUMINUM COMBUSTION IN SULFUR HEXAFLUORIDE ATMOSPHERE Contractor Report, Apr. - Jul. 1985
J. Kol and Y. Chozev Jul. 1985 40 p
(Contracts N62271-84-M-3357; N62271-84-M-3055)
(AD-A159196; NPS67-85-001CR) Avail: NTIS HC A03/MF A01 CSCL 21/2

The goal of this report is to summarize the experimental results and studies of aluminum combustion in sulfur hexafluoride atmosphere. The particles were ejected from exploding wire. Using photography, burning time, particle size, velocity, deceleration, and temperature were measured. Typical results are as follows: 380 + or - 25 micron diameter; particles burn in 10 + or - .75 ms; the average initial velocities were from 10 m/s to 15 m/s; the average decelerations were from 4000 m/sq s to 8000 m/sq s. The average temperature of the burning particle was 2750 + or - 150 K. According to the burning studies of the particles and the measured temperature results the mechanism of burning can be surface burning or vapor phase burning that occurs close to the surface of the hot particle. Author (GRA)

N86-14339# Army Missile Command, Redstone Arsenal, Ala. Propulsion Directorate.
LIQUID CHROMATOGRAPHIC ANALYSIS OF NITROCELLULOSE-BASE PROPELLANTS Final Technical Report
J. G. Carver 23 Apr. 1985 85 p
(AD-A159282; AD-E950745; AMSMI/RK-85-7-TR) Avail: NTIS HC A05/MF A01 CSCL 07/4

A procedure has been developed that is able to predict the optimum conditions for separation of the ingredients of a complex mixture by liquid chromatography. The procedure involves establishing a data base of retention times for a large number of propellant ingredients in 7 predetermined combinations of 3 solvents. When a new combination of some of these ingredients is encountered, a computer analysis of the retention times of the ingredients from the data base will predict the best solvent composition to separate all the ingredients. The details of the procedure and several examples of its use are discussed. This product has been accomplished as part of the US Army Materials Testing Technology Program, which has for its objective the timely establishment of testing techniques, procedures, or prototype equipment (in

mechanical, chemical or nondestructive testing) to insure efficient inspection methods for materiel/material procured or maintained by DARCOM. Author (GRA)

N86-14340# Cornell Univ., Ithaca, N.Y. School of Chemical Engineering.
STUDIES OF DISSOLUTION PHENOMENA IN MICRO-LITHOGRAPHY
P. D. Krasicky, R. J. Groele, J. A. Jubinsky, K. U. Pohl, and F. Rodriguez 5 Sep. 1985 13 p
(Contract N00014-85-K-0474)
(AD-A159482) Avail: NTIS HC A02/MF A01 CSCL 14/5

Laser interferometry is useful for measuring the dissolution rate of thin polymer films. During the dissolution process, polymer in the glassy state is transported into a dilute solution. In some cases, a transition layer can be measured using laser interferometry. This layer is seen as a difference in reflected light intensity between the bare substrate and the maximum during dissolution. When PMMA dissolves in methyl ethyl ketone, the layer is not detectable below a polymer M subscript n of about 30,000. The layer becomes more pronounced as molecular weight of polymer increases. GRA

N86-14341# Texas A&M Univ., College Station. Dept. of Chemistry.
MACROCYCLES CONTAINING TIN. THE 119Sn NMR STUDIES OF CHLORIDE BINDING BY LEWIS ACIDIC TIN COMPOUNDS. MULTIDENTIATE EFFECTS, MACROCYCLIC EFFECTS AND SIZE SELECTIVITY
M. Newcomb, A. M. Madonik, M. T. Blanda, and J. K. Judice 15 Sep. 1985 27 p
(Contract N00014-79-C-0584)
(AD-A159505; TR-6) Avail: NTIS HC A03/MF A01 CSCL 07/4

Three macrocyclic Lewis acidic hosts containing two symmetrically disposed dichlorostanna moieties (1-3, ring sizes 18, 22, 26 atoms, respectively) have been prepared as has an acyclic di-tin model (5,5,16,16-tetrachloro-5,16-distannadocosane, 4). The complexation of 1-4 and dibutyltin dichloride (5) with chloride ion in acetonitrile was studied by 119Sn NMR spectroscopy. Rapid exchange of chloride between tin atoms occurred at all ratios of chloride to host studied. An iterative computer program was used to provide estimates of the binding constants of 1, 2, 4 and 5 with chloride. Competition experiments were performed wherein two di-tin hosts competed for limited chloride ion, and the 119Sn NMR spectra of the mixtures were analyzed to determine the relative amount of chloride bound by each host and hence the ratio of the binding constants found in the latter studies and the ratios of the absolute binding constants found in the former studies. The energies of binding were calculated. The di-tin hosts exhibited cooperative bidentate effects in binding chloride in comparison to 5, leading to an increase in binding energy over the amount predicted for a statistical correction in the number of sites. The cyclic hosts 1-3 bind chloride more strongly than acyclic model 4 (macrocyclic effect). Host 1 binds chloride somewhat more strongly than host 2 (size-selective effect). GRA

N86-14342# California Univ., Los Angeles.
RECENT DEVELOPMENTS IN BETA ALUMINA
B. Dunn and G. C. Farrington Sep. 1985 12 p
(Contract N00014-83-K-0498)
(AD-A159526; TR-6) Avail: NTIS HC A02/MF A01 CSCL 07/4

The multivalent Beta aluminas are the first family of high conductivity solid electrolytes for divalent and trivalent cations. The rich ion exchange chemistry of these materials leads to a variety of chemical environments within the conduction plane which consequently influence their ion transport and optical properties. This paper reviews some of the pertinent structural aspects of the multivalent Beta-aluminas and considers the properties of selected systems which contain either mixed ions or ions with two valence states within the conduction plane. The experimental and theoretical work reviewed herein indicate that a wide variety of chemical environments exist in the multivalent Beta-aluminas and that these environment influence properties. Ion transport processes in mixed ions systems were found to be influenced by correlated ion motion and ordering effects, while optical properties of lanthanide exchanged Beta-aluminas were quite sensitive to local configurations. The precise means by which properties are affected by chemical environments is an area worthy of continued interest, and the multivalent Beta-aluminas offer and excellent vehicle in which to study these effects in two-dimensional environments. GRA

N86-14343# California Univ., Los Angeles
CONDUCTIVITY CHANGE DURING REPLACEMENT OF Na(+) BY Ag(+) IN POLYCRYSTALLINE BETA ALUMINA
M. Breiter, M. Maly-Schreiber, and B. Dunn Sep. 1985 8 p
(Contract N00014-83-K-0498)
(AD-A159528; TR-5) Avail: NTIS HC A02/MF A01 CSCL 07/4

The longitudal conductivity was determined by a four-probe technique during the replacement of Na+ ions by Ag+ ions from the inside of a closed-end tube. Similarly, the radial conductivity was measured during exchange starting from the outside. The conductivity-time curves display a minimum with a conductivity value below that of the Ag Beta alumina. The results also show that the change in conductivity with ion exchange time is steeper than that predicted by various models. The effects likely to produce additional resistances are presented. The experimental work clearly indicates that the distribution of the ion exchanged species is of central importance. As a result, a relatively small amount of ion exchange can exert a large influence on the conductivity. In radial measurements, the replacement of only 20% Na+ is able to cause conductivity values representative of Ag+ beta alumina. This behavior is quite significant for battery applications where cell resistance is measured in the radial direction. The exchange effect is not nearly as dramatic for the longitudinal configuration. In this case parallel resistance paths are available and nearly as dramatic for the longitudinal configuration. In this case parallel resistance paths are available and nearly 50% exchange is necessary before the conductivity of Ag+ beta alumina is attained. GRA

N86-14344# Cincinnati Univ., Ohio. Dept. of Chemistry.
ROTATING DISC VOLTAMMETRY AT POLYPYRROLE MODIFIED ELECTRODES Final Report
Oct. 1984 1 p
(Contract N00014-84-C-2194)
(AD-A159623) Avail: NTIS HC A02/MF A01 CSCL 07/4

The nature and uniformity of insitu electrogenerated Polypyrrole Films (PPF's) are strongly influenced by the nature of the electrode, deposition potential and uniformity of the current density at the electron surface. A uniform current density during deposition is absolutely essential. In general, it appears that deposition first occurs at isolated active sites followed by radial growth out from these sites. This phenomonae appears to occur at all materials studied but seems more pronounced on SnO2 coated glass than on metal surfaces. The optimal electropolymerization potential found in this study (+1000 mV) is well into the oxidation wave of pyrrole. In our experience the use of potential pulses rather than a steady dc potential does not seem to improve PPF homogeneity, in contrast to the results obtained by other workers. One important question about PPF electrodes relates the mechanism of the transport of species to the electrochemically active surface. An interesting possibility is that an ionic gating mechanism is evolved and that electrochemically neutral PPF would be a porous membrane, with the electronically conducting polymer chains increasing the area of the electrode. This possibility was investigated using Rotating Ring Disk (RD) techniques. GRA

N86-14345# School of Aerospace Medicine, Brooks AFB, Tex.
LIPOPROTEIN AGAROSE GEL ELECTROPHORESIS. APPLICATION IN HDL-CHOLESTEROL METHODOLOGY Interim Report, Jan. 1980 - Jan. 1985
E. L. Mosser and D. A. Clark Jun. 1985 17 p
(AF Proj. 7755)
(AD-A159627; USAFSAM-TR-85-41) Avail: NTIS HC A02/MF A01 CSCL 06/1

We perform agarose gel lipoprotein electrophoresis (AGLE) in this laboratory using glass microscope slides to support the agarose

gel and 0.025 M barbital buffer for the electrophoresis. This report describes details, including special apparatus used to facilitate making and handling agarose gel slides. To test correlations between serum lipid levels and the densities of the corresponding lipoprotein bands separated by electrophoresis, we electrophoresed eight individual sera and measured the densities of the resulting lipoprotein bands. Serum level of total cholesterol, triglycerides, and HDL-cholesterol were correlated with the measured densities of the beta, prebeta, and alpha lipoprotein bands respectively. Coefficients for correlation between total cholesterol and beta lipoprotein, triglyceride and prebeta lipoprotein, and HDL-cholesterol and alpha lipoprotein were 0.638, 0.914, and 0.920 respectively. Densitometric data from 24 replicate electrophoresis slides showed that the coefficient of variance for the percentage of dye bound to the beta, prebeta, and alpha lipoproteins was 1.9%, 2.6% and 4.5% respectively. We used AGLE to monitor the separation of high-density lipoprotein (HDL) from the combined low-density lipoproteins (LDL) and very low density lipoproteins (VLDL) during the titration of serum lipoproteins with increasing amounts of lipoprotein precipitant. Results demonstrated which levels of precipitant removed all detectable VLDL + LDL and which levels of precipitant removed a significant amount of HDL. These data, together with the levels of cholesterol in the supernate from the various tubes, identified the optimum precipitant volumes to be used in routine determinations of serum HDL-cholesterol levels. GRA

N86-14346# Thermo Electron Corp., Waltham, Mass. Thermal Products Div.
RESEARCH INTO A SPECTRAL FLAME ANALYZER, PHASE 1 Final Report, 21 Apr. 1983 - 30 Jun. 1985
F. Fraim 1 Jun. 1985 86 p
(DE85-017031; DOE/ID-12463/1) Avail: NTIS HC A05/MF A01

Optimum continuous combustion control of a multiple burner can be achieved only if each individual burner can be continuously checked. The most promising method to achieve individual control is based on spectral emission from each burner flame. The intensity of certain emissions from chemical species formed during combustion are indicative of the fuel-air ratio of the burner. An optical monitor tuned to these emission bands provides the needed burner control signal. Early tests with the Spectral Flame Analyzer demonstrated the potential of this approach, but unpredictable results indicated that the problem is more difficult than the original system was designed for. Controlled laboratory tests indicated that spectral measurements in the ultraviolet spectrum are essential for flame quality prediction, in addition to the infrared measurements made by the original design. The work involved in adding the ultraviolet measurement capability of the original design and the initial test results with the improved system are discussed. These initial tests with gas, oil, and coal-water slurry fuels indicated that the new design is a clear improvement over the original unit. DOE

N86-14347# Sandia National Labs., Albuquerque, N. Mex.
PHOTOCHEMICALLY VOLATILIZED POLYSILANES: A NEW CLASS OF SELF-DEVELOPING DEEP UV RESISTS
J. M. Zeigler, L. A. Harrah, and A. W. Johnson 1985 6 p refs Presented at the 190th American Chemical Society National Meeting, Chicago, Illinois, 8 Sep. 1985
(Contract DE-AC04-76DP-00789)
(DE85-010655; SAND-85-0920C; CONF-850942-11) Avail: NTIS HC A02/MF A01

A resist material which combines high short-wavelength sensitivity, self-development (i.e., generation of the resist image directly upon exposure), and resistance to dry-etching procedures is a major goal. While sensitive self-developing materials are known for use in the deep-UV, e.g., poly(olefin sulfones) reported by Bowden and coworkers and sensitized end-capped poly (phthalaldehyde), their resistance to plasma etchants is marginal. A number of groups have reported the direct deep-UV laser etching of a variety of organic polymeric materials, but exposures of >1 J/cm(2) are required for removal of a 1 (MU) thick film in these cases. In this paper, we describe a new class of alkyl polysilane copolymers which exhibit relatively efficient self-developing behavior and have excellent resistance to O2 reactive ion etchants. Films of these new polysilanes 1 (MU) in thickness can be completely photochemically volatilized to give submicron feature resolution at total exposures of 500 to 1000 mJ/cm(2) of deep-UV from a KrF excimer laser (248 nm) or low-pressure Hg lamp (254 nm). DOE

N86-14348# Mound Lab., Miamisburg, Ohio.
ELECTROCHEMISTRY OF HEXANITROAZOBENZENE: REACTIVITY WITH METALS AND SYNTHETIC IMPLICATIONS
D. W. Firsich Aug. 1985 15 p refs
(Contract DE-AC04-76DP-00053)
(DE85-016652; MLM-3279) Avail: NTIS HC A02/MF A01

The electrochemical properties of hexanitroazobenzene (HNAB) are defined as an aid towards understanding the general reactivity of this commonly used explosive. Cyclic voltammetry, controlled potential coulometry, and visible spectroscopy are used to characterize the anion, dianion, protonated dianion, and diprotonated dianion of HNAB. The acid/base relationships of these species are established, and their role in the present synthetic method for producing HNAB is clearly defined. The feasibility of an electrochemical synthesis for HNAB is demonstrated. It is shown that the reaction between aluminum metal and HNAB in solution produces the protonated dianion of HNAB, and that reactions between other common metals and HNAB do occur. The visible absorption maxima of a number of possible decomposition products of HNAB are compiled. Related chemistry involving a triazole oxide derivative is presented. DOE

N86-14349# National Bureau of Standards, Boulder, Colo.
DIAGNOSTICS OF GLOW DISCHARGES USED TO PRODUCE HYDROGENATED AMORPHOUS SILICON FILMS Subcontract Report, 15 Apr. 1984 - 14 Apr. 1985
A. Gallagher and J. Scott Jul. 1985 38 p
(Contract DE-AC02-83CH-10093)
(DE85-016847; SERI/STR-211-2760) Avail: NTIS HC A03/MF A01

Measurements of monosilane and disilane radicals were made at the surface of dc glow discharges (GD) in pure silane and silane-argon mixtures. These observations were interpreted as discharge kinetic models. It was inferred that the dominant radical, SiH3, is produced in the gas and is primarily responsible for film growth. The heavier radicals observed in the gas appear to be a consequence of surface reactions, as is the disilane, a major product of the monosilane decomposition. A detailed model of the ion chemistry in the discharge was formulated to derive theoretical distributions of ions at the cathodes of low-pressure dc discharges. Chemical vapor deposition (CVD) rates of silane and disilane, measured previously in the laboratory, have now also been interpreted in detail to yield a self-consistent model for the CVD process. This model identifies and quantifies the role of H2 as an inhibitor of silane GD and CVD deposition. Implications of these discoveries to deposition rates and film properties are discussed. DOE

N86-14350# Los Alamos National Lab., N. Mex.
COHERENT AND SPONTANEOUS RAMAN SPECTROSCOPY IN SHOCKED AND UNSHOCKED LIQUIDS
S. C. Schmidt, D. S. Moore, D. Schiferl, M. Chatelet, T. P. Turner, J. W. Shaner, D. L. Shampine, and W. T. Holt 1985 46 p refs Presented at the NATO Advanced Study Institute: Advances in Chemical Reaction Dynamics, Iraklion, Crete, 25 Aug. 1985
(Contract W-7405-eng-36)
(DE85-017543; LA-UR-85-2964; CONF-8508119-1) Avail: NTIS HC A03/MF A01

Coherent and non-coherent Raman spectroscopy is being used to study the structure and energy transfer in molecular liquids at high pressures. Stimulated Raman scattering, coherent anti-Stokes Raman scattering, and Raman induced Kerr effect scattering measurements have been performed in liquid benzene and liquid nitromethane shocked to pressures up to 11 GPa. Frequency shifts were observed for the 992 cm(-1) ring stretching mode of benzene and the 920 cm(-1) CN stretching mode of nitromethane. Results

of these dynamic experiments are compared to spontaneous Raman scattering measurements made in a high temperature diamond anvil cell. Also, a picosecond infrared pump/spontaneous anti-Strokes Raman probe experiment is being used to measure CH stretch vibrational relaxation times in liquid halogenated methanes statically compressed to a few tenths GPa. DOE

N86-14351# New Mexico Univ., Albuquerque. Dept. of Chemical and Nuclear Engineering.
INFLUENCE OF SHOCK COMPRESSION ON THE SPECIFIC SURFACE AREA OF INORGANIC POWDERS
F. L. Williams, B. Morosin, and R. A. Graham 1985 11 p refs Presented at the EXPLOMET '85 - International Conference on Metallurgical Applications of Shock Wave and High Strain-Rate Phenomena, Portland, Oregon, 28 Jul. 1985 Prepared in cooperation with Sandia Labs., Albuquerque, New Mexico
(Contract DE-AC04-76DP-00789)
(DE85-016816; SAND-85-1706C; CONF-850770-5) Avail: NTIS HC A02/MF A01

Four characteristic behaviors as a function of peak shock pressure have been observed for changes in the specific area of inorganic powders modified by shock wave loading. The mechanisms producing the observed responses appear to be abrupt phase change, communition of particles and interparticle bonding. Recently, classical BET surface area measurements were reported for compacts of aluminum oxide, zinc oxide, aluminum nitride, titanium carbide and titanium diboride after they were subjected to controlled shock-loading to mean peak pressures from 4 to 27 GPa. Extension to specific surface area measurements of shock loaded hematite, magnetite, manganese dioxide and well annealed alumina powders has been accomplished. Sampling from the edge, center and the bulk of shock-loaded compacts of these powders reveals variation in the degree of modification consistent with the calculated variation of the shock pressure and shock temperature. It was also found that the apparent response of a material to shock-loading can be masked if the starting material is already highly defected. DOE

N86-14918# Cornell Univ., Ithaca, N.Y. Dept. of Theoretical and Applied Mechanics.
NUMERICAL INVESTIGATION OF THE STABILITY OF DIFFUSION FLAMES NEAR EXTINCTION AND IGNITION
Y. S. Choi, C. Laine-Schmidt, and G. S. S. Ludford *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 225-230 (For primary document see N86-14902 05-59)
(AD-P004917) Avail: NTIS HC A99/MF E03 CSCL 12/1

N86-14921# Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Mathematical Sciences.
SHOCK-INDUCED THERMAL RUNAWAY
T. L. Jackson and A. K. Kapila *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 261-272 (For primary document see N86-14902 05-59)
(AD-P004920) Avail: NTIS HC A99/MF E03 CSCL 07/4

N86-14934# Clarkson Coll. of Technology, Potsdam, N.Y. Dept. of Mechanical and Industrial Engineering.
SOLITARY, PERIODIC AND CHAOTIC WAVES IN THIN FILMS
S. P. Lin and O. Suryadevara *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 483-499 (For primary document see N86-14902 05-59)
(AD-P004934) Avail: NTIS HC A99/MF E03 CSCL 12/1

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N86-14352# Overseas Relations Branch Translation Service, London (England).
DIFFUSION OF TITANIUM IN CHLORIDE ELECTROLYTES
V. S. Balikhin and S. B. Makarov Sep. 1985 8 p refs Transl. into ENGLISH from Elektrokhimiya (USSR), v. 20, no. 5, 1984 p 696-698
(BLL-OA-Trans-3251-(6196.3)) Avail: NTIS HC A02/MF A01

The fall in temperature during electrolytic refining and production of titanium in chloride metals is an important factor in improving the technological and economic indices of the process: the purity of the deposited metal is greater, the service life of the apparatus is extended, power consumption is reduced and conditions of work are improved. The method used at present to obtain macrocrystalline titanium of a high degree of purity involves electrolytes consisting of an equimolar mixture of sodium and potassium chlorides, permitting operation at temperatures not less than 750C. The use of a low-melting mixture (wt.%) of NaCl 25 - KCl 35 - MgCl240 permits the electrolysis temperature to be reduced to 550 to 580C. In this case, however, the metal on the cathode is deposited in the form of a fine powder (the main body is represented by the 0.5-0.08 mm fraction) with a high content of gaseous impurities. The cause of the disruption to electrocrystallization is the insufficient diffusion of titanium ions towards the cathode. The problem of low-temperature electrorefining to produce titanium of a high degree of purity cannot be solved simply by selection of low-melting salt mixtures without taking into account the diffusion coefficients of the titanium ions. Author

N86-14353*# Alabama Univ., University. Dept. of Metallurgical Engineering.
GRAPHITE FORMATION IN CAST IRON, PHASE 2 Final Report
Doru M. Stefanescu and Michael R. Fiske Jun. 1985 45 p ref (Grant NAG8-469)
(NASA-CR-176411; NAS 1.26:176411; BER-354-202) Avail: NTIS HC A03/MF A01 CSCL 11F

Several types of cast irons are directionally solidified aboard the KC-135 aircraft. Also, control samples are run on Earth for comparison. Some of these samples are unusable because of various mechanical problems; the analysis and the interpretation of results on the samples that are run successfully is discussed. Author

N86-14354*# Drexel Univ., Philadelphia, Pa.
STRUCTURE-PROPERTY CHARACTERIZATION OF RHEOCAST AND VADER PROCESSED IN-100 SUPERALLOY Ph.D. Thesis. Final Report
Jung-Jen Allen Cheng and Diran Apelian Jun. 1985 234 p refs (Grant NAG3-14)
(NASA-CR-175014; NAS 1.26:175014) Avail: NTIS HC A11/MF A01 CSCL 11F

Two recent solidification processes have been applied in the production of IN-100 nickel-base superalloy: rheocasting and vacuum arc double electrode remelting (VADER). A detailed microstructural examination has been made of the products of these two processes; associated tensile strength and fatigue crack propagation (FCP) rate at an elevated temperature were evaluated. In rheocasting, processing variables that have been evaluated include stirring speed, isothermal stirring time and volume fraction solid during isothermal stirring. VADER processed IN-100 was purchased from Special Metals Corp., New Hartford, NY. As-cast ingots were subjected to hot isostatic pressing (HIP) and heat treatment. Both rheocasting and VADER processed materials yield fine and equiaxed spherical structures, with reduced macrosegregation in comparison to ingot materials. The rheocast structures are discussed on the basis of the Vogel-Doherty-Cantor model of dendrite arm fragmentation. The rheocast ingots evaluated were superior in yield strength to both VADER and commercially cast IN-100 alloy. Rheocast and VADER ingots may have higher crack propagation resistance then P/M processed material. Author

N86-14355*# Wisconsin Univ., Madison.
UNDERCOOLING AND SOLIDIFICATION BEHAVIOR IN THE InSb-Sb SYSTEM M.S. Thesis. Final Report
Jeffrey Alan Graves Sep. 1985 217 p refs

(Contract NAS3-14)
(NASA-CR-175013; NAS 1.26:175013) Avail: NTIS HC A10/MF A01 CSCL 11F

Use of the droplet emulsion technique has been successful in studying the undercooling and crystallization behavior of Sb, InSb, and an InSb-Sb eutectic alloy. Both droplet size and imposed cooling rate were influential in controlling the extent of liquid undercooling. The droplet surface coating was of significant importance in determining the resultant solidification product structure through its effect on nucleation kinetics. The maximum undercooling for pure Sb was extended from 0.08 to 0.23 T sub m. While simple crushing techniques provided a dramatic increase in droplet undercooling over the bulk material, emulsification treatments both enhanced this undercooling and allowed successful formation of a metastable simple cubic Sb phase. This phase was stable to temperatures approaching the melting point. The simple cubic phase was detected in droplet samples processed using DTA, air and water quenching, and drop tube processing under a helium gas atmosphere. A deviation in the InSb parent ingot composition limited interpretation of the line compound results, however, emulsification techniques extended the undercooling of this material to 0.17 T sub L and provided a stable, protective surface coating for the droplets. Emulsification of the eutectic alloy was effective at producing various levels of undercooling from 0.1 to 0.2 T sub E. Microstructural examination revealed a normal-type eutectic structure in the undercooled droplets indicating that solidification occurred within the coupled zone and that this zone is somewhat symmetric about the eutectic composition. B.W.

N86-14356*# Texas A&M Univ., College Station. Dept. of Aerospace Engineering.
DEVELOPMENT OF CONSTITUTIVE MODELS FOR CYCLIC PLASTICITY AND CREEP BEHAVIOR OF SUPER ALLOYS AT HIGH TEMPERATURE Final Report
Walter E. Haisler 30 Sep. 1983 161 p refs
(Grant NAG3-31; Research Foundation Proj. 4246)
(NASA-CR-176418; NAS 1.26:176418) Avail: NTIS HC A08/MF A01 CSCL 11F

An uncoupled constitutive model for predicting the transient response of thermal and rate dependent, inelastic material behavior was developed. The uncoupled model assumes that there is a temperature below which the total strain consists essentially of elastic and rate insensitive inelastic strains only. Above this temperature, the rate dependent inelastic strain (creep) dominates. The rate insensitive inelastic strain component is modelled in an incremental form with a yield function, blow rule and hardening law. Revisions to the hardening rule permit the model to predict temperature-dependent kinematic-isotropic hardening behavior, cyclic saturation, asymmetric stress-strain response upon stress reversal, and variable Bauschinger effect. The rate dependent inelastic strain component is modelled using a rate equation in terms of back stress, drag stress and exponent n as functions of temperature and strain. A sequence of hysteresis loops and relaxation tests are utilized to define the rate dependent inelastic strain rate. Evaluation of the model has been performed by comparison with experiments involving various thermal and mechanical load histories on 5086 aluminum alloy, 304 stainless steel and Hastelloy X. Author

N86-14357# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.
NEW POWDER TECHNOLOGIES FOR MOLYBDENUM ALLOY GUN BARREL LINERS Final Technical Report
J. M. Barranco and S. Isserow Jun. 1985 42 p Presented at Powder Metallurgy in Defense Technology Seminar, Dover, New Jersey, 24-26 Sep. 1984
(AD-A158315; AD-E440289; ARLCB-TR-85017) Avail: NTIS HC A03/MF A01 CSCL 19/6

Molybdenum is an attractive material for resisting gun barrel erosion because of its high melting point and mechanical properties. In previous efforts, molybdenum has been unsatisfactory because of the coarse grains and strong anisotropy in conventionally processed material. Powder metallurgy offers the opportunity to overcome these deficiencies. New technologies for preparing and consolidating powders are therefore being investigated to permit utilization of the benefits of molybdenum for this and related applications. Work will be reported on alloy powders prepared by various methods with emphasis on rapid solidification, either by rotating electrode (REP and PREP) or by plasma melting (PMRS, plasma melted rapidly solidified). To date, consolidation has been primarily by hot isostatic pressing (HIP). GRA

N86-14358# Rensselaer Polytechnic Inst., Troy, N.Y.
US/JAPAN SEMINAR ON SUPERALLOYS HELD AT SUSONO, JAPAN ON 7-11 DECEMBER 1984 Final Report, 1 Sep. 1984 - 1 Mar. 1985
N. S. Stoloff 31 Dec. 1984 44 p Seminar held at Susono, Japan, 7-11 Dec. 1984
(Grant AF-AFOSR-0262-84)
(AD-A158464; AFOSR-85-0346TR) Avail: NTIS HC A03/MF A01 CSCL 11/6

The US/Japan Seminar on Superalloys was held on December 7 to 11, 1984. The scope of Japanese work on superalloys is comprehensive, with papers presented on the following subjects: alloy development, processing, mechanical properties, surface stability (oxidation and hot corrosion), phase stability and alternative materials (especially intermetallic compounds). These subjects represent a marked expansion of Japanese efforts on superalloys since the previous meeting in 1972. GRA

N86-14359# North Carolina State Univ., Raleigh.
PROCESS VARIABLE-STRUCTURE RELATIONSHIPS IN MECHANICAL ALLOYING Annual Report, 1 Jul. 1984 - 30 Jun. 1985
C. C. Koch 30 Jun. 1985 11 p
(Contract N00014-84-K-0253)
(AD-A158612; AD-F630681) Avail: NTIS HC A02/MF A01 CSCL 11/6

The goal of this research is to elucidate the mechanism(s) controlling Mechanical Alloying (MA) and the alloy structures so formed. The experimental approach is to systematically study process variables such as temperature, energy input, environment, and starting material and relate such variables to the structure produced by MA. Microanalytical and structure determinations emphasize electron microscopy and X-ray diffraction methods. Quantification of the mechanism(s) is sought. GRA

N86-14360# Lehigh Univ., Bethlehem, Pa. Dept. of Metallurgy and Materials Engineering.
CRACK PROPAGATION IN POWDER METALLURGY HOT ISOSTATICALLY PRESSED NICKEL-BASED ALLOY Annual Report, 1 Jan. - 31 Dec. 1984
R. W. Hertzberg 5 May 1985 33 p
(Grant AF-AFOSR-0029-83)
(AD-A158885; AFOSR-85-0672TR) Avail: NTIS HC A03/MF A01 CSCL 11/6

The room temperature threshold fatigue behavior of P/M HIP'd L.C. Astroloy has been examined. Material with grain sizes ranging form 5 micrometers to 50 micrometers has been tested to investigate the influence of grain size on the threshold response. In disc compact tension specimens grain size is observed to have little influence on the threshold values; in contrast tests conducted in four point bend specimens exhibit lower threshold values. Consideration has also been given to the growth of short cracks under cyclic loading at low stress intensities. The data reveal that under these conditions short cracks propagate at a consistently faster rate than long cracks subject to the same nominal stress intensity. Analytical work has been conducted which suggests that this behavior may be rationalized in terms of a more appropriate driving force for crack extension. Detailed microstructural information has been collected which identifies the major second phase particles present in the alloy. The effect of simple heat treatments on the distribution of these particles has been observed to be negligible. Author (GRA)

N86-14361# Michigan Technological Univ., Houghton. Dept. of Metallurgical Engineering.
THE COMBINED EFFECT OF STRESS STATE AND GRAIN SIZE ON HYDROGEN EMBRITTLEMENT OF TITANIUM
D. A. Gerard and D. A. Koss Jul. 1985 12 p
(Contract N00014-85-K-0427)
(AD-A158923; TR-1) Avail: NTIS HC A02/MF A01 CSCL 11/6

The influence of grain size on the hydrogen embrittlement of titanium sheets is shown to depend on stress state. Results are presented which indicate that the deleterious effect of a large grain size on the susceptibility to hydrogen embrittlement is more severe in equibiaxial tension than in uniaxial tension. This effect may be understood in terms of the sensitivity of both void nucleation (due to hydride fracture) and void link-up due to the combined effects of large gain/hydride sizes and the large multidirectional, normal stresses that develop during deformation of plastically anisotropic sheets in equibiaxial tension. Author (GRA)

N86-14362# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
NUMERICAL SIMULATION OF DIRECTIONAL SOLIDIFICATION OF CASTINGS
Y. Quiping and Z. Yaohe 19 Aug. 1985 18 p Transl. into ENGLISH from Hangkong Xuebao (China), v. 5, no. 3, Sep. 1984 p 313-321
(AD-A159179; FTD-ID(RS)T-0463-85) Avail: NTIS HC A02/MF A01 CSCL 11/6

Some rules for numerical simulation of the directional solidification process with steep temperature gradient were investigated. In order to improve the accuracy of calculation, the effect of the term (del k/del T) (del T/del Z) squared in the heat transfer equation on the outcome with steep temperature gradient is discussed. Problems such as how to treat latent heat of solidification, thermal properties at the casting/mold interface and the initial condition are also analyzed. Both finite difference and finite element methods were used to calculate the same casting under identical initial and boundary conditions with the same physical parameters. The results were compared. Author (GRA)

N86-14363# Virginia Univ., Charlottesville. Dept. of Materials Science.
THE EFFECT OF MICROSTRUCTURE ON THE CREEP BEHAVIOR OF Ti-6Al-2Nb-1Ta-0.8Mo Final Report, 1 Feb. 1983 - 31 Mar. 1985
W. H. Miller, Jr. and E. A. Starke, Jr. Sep. 1985 133 p
(Contract N00014-83-K-0242)
(AD-A159532; UVA/525382/MS86/101) Avail: NTIS HC A07/MF A01 CSCL 11/6

The effects of microstructure, temperature, stress level and crystallographic orientation on the creep response of Ti-6211 have been investigated. A variety of microstructures simulating the heat affected zone of a weld (HAZ) as well as the as-received structure were tested in a temperature range of 298K to 873K. At stress levels below the tensile yield strength, creep curves level off and saturate in the ambient temperature regime. The colony tupe Widmanstatten alpha + beta as received structure exhibited the highest creep strains at ambient temperatures (T > 0.2Tm). Steady state creep was attained at elevated temperature (T > 0.4Tm) where wavy dislocation lines and dislocation loops were more homogeneously distributed than at ambient temperatures. Activation energy determinations indicate that creep mechanisms are dependent on a creep rate/temperature relationship. Above 778K the activation energy of creep is close to that of self-diffusion in titanium, suggesting that diffusion-controlled dislocation mechanisms are the rate-controlling processes at elevated temperatures. Creep rupture at elevated temperatures occurred by microwave nucleation and growth. Cyclic creep with a loading-unloading sequence was performed at room temperature and cyclic creep acceleration was observed. The reduction of internal stress in the unloading period enhanced the creep rate in subsequent loading. GRA

N86-14364# Lawrence Livermore National Lab., Calif.
INVESTIGATION OF THE CRYOGENIC MECHANICAL PROPERTIES OF LOW THERMAL-EXPANSION SUPERALLOYS
L. T. Summers and E. N. C. Dalder 30 Jul. 1985 9 p Presented at Cryogenic Engineering Conference and International Cryogenic Materials Conference, Boston, Massachusetts, 12 Aug. 1985
(Contract W-7405-eng-48)
(DE85-016650; UCRL-92345; CONF-850814-1) Avail: NTIS HC A02/MF A01

Four Fe-based superalloys, JBK-75, Incoloy 903, Incoloy 905, and Incoloy 909 were evaluated as tube materials for ICCS Nb3Sn superconductors. Evaluation consisted of 4-K tensile and elastic-plastic fracture-toughness testing, and a microstructural characterization of unwelded and autogenously gas-tungsten-arc welded sheet given a simulated postweld processing treatment of 15% cold reduction by rolling followed by a Nb3Sn-reaction heat treatment of 96 hours at 700(0)C plus 48 hours at 730(0)C. Results indicate that JBK-75 and Incoloy 903 showed satisfactory combinations of strength and toughness for ICCS tube use requiring long Nb3Sn-reaction heat treatments. Incoloy 905 welds and 909 showed unacceptable fracture toughness. Results are discussed in terms of microstructural changes caused by the extended Nb3Sn-reaction heat treatment. DOE

N86-14365# Pacific Northwest Lab., Richland, Wash.
OXIDATION OF ZIRCALOY-4 IN STEAM AT 1300 TO 2400 DEG C
Jun. 1985 26 p Presented at the 7th International Conference on Zirconium in the Nuclear Industry, Strasbourg, France, 24 Jun. 1985
(Contract DE-AC06-76RL-01830)
(DE85-016281; PNL-SA-13122; CONF-850601-2) Avail: NTIS HC A03/MF A01

The oxidation kinetics of Zircaloy-4 in steam have been extended to 2400 C. Growth of the ZrO2 and ALPHA-Zr layers display parabolic behavior over the entire temperature range studied; however, a discontinuity in the oxidation kinetics above 1510 C causes rates to increase above those previously established by the Baker-Just relationship. This increase coincides with the tetragonal-to-cubic phase transformation in ZrO/sub 2-x/. No additional discontinuity in the oxide growth rate is observed upon melting of Zr(O). The effects of temperature gradients have also been taken into account and corrected values representative of near-isothermal conditions have been computed. Experiments have been performed in steam-hydrogen mixtures at 1565 and 1815 C. Concentrations of hydrogen up to 90 mole % have no effect on the oxidation kinetics. The rate controlling factor appears to be the available flux of oxygen atoms incident to the reaction surface, and is not dependent upon hydrogen content. DOE

N86-14366# Colorado School of Mines, Golden. Dept. of Physics.
MOESSBAUER STUDY OF SHOCK-SYNTHESIZED ZINC FERRITE
D. L. Williamson, B. Morosin, E. L. Venturini, and R. A. Graham 1985 6 p Presented at the American Physical Society Topical Conference on Shock Waves in Condensed Matter, Spokane, Washington, 22 Jul. 1985 Prepared in cooperation with Sandia National Labs., Albuquerque, New Mexico
(Contract DE-AC04-76DP-00789)
(DE85-016194; SAND-85-0328C; CONF-850736-57) Avail: NTIS HC A02/MF A01

Moessbauer spectroscopy at room temperature has been used to characterize ZnO-Fe2O3 powder mixtures subjected to shock loading at 22 GPa with associated peak shock temperatures ranging from 300 to 655C. The (Fe-5) spectra for the shock-synthesized zinc ferrite yield similar values for the isomer shift, quadrupole splitting and magnetic hyperfine field suggesting that the same composition is produced over a wide range of shock conditions. A comparison is made to furnace-reacted material prepared from the same powder mixture. DOE

N86-14367# Lawrence Livermore National Lab., Calif.
DEVELOPMENT OF ACCURATE ESTIMATION METHODS FOR CALCULATING THERMAL EXPANSIVITIES OF HARD MATERIALS. REVISION 1
O. H. Krikorian 26 Jul. 1985 20 p Presented at the 2nd International Conference on the Science of Hard Materials, Rhodes, Greece, 23 Sep. 1984
(Contract W-7405-eng-48)
(DE85-016284; UCRL-90189-Rev-1; CONF-8409117-2-Rev-1) Avail: NTIS HC A02/MF A01

On the basis of qualitative theoretical arguments and correlation studies, we find the thermal expansivities, (BETA), of borides, carbides, nitrides, and oxides can be predicted to within about +-10% based on two parameters: (DELTA)E/sub a/, the atomization energy, which is a measure of bond strength; and h, the microhardness, which is a measure of the steepness of the extension side of the potential energy well. The correlation is described by the relation (BETA) = 21.1 (DELTA)E/sub a/ (-1)(T/h)/sup 1/3/, where (DELTA)E/sub a/ is in kJ/g-atom and h is in HK units. DOE

N86-14368# Oak Ridge National Lab., Tenn.
SEGREGATION TO BOUNDARIES IN AN ANTIMONY-CONTAINING STAINLESS STEEL
E. A. Kenik 1985 3 p Presented at the Joint Meeting of the Electron Microscopy Society of America and the Microbeam Analysis Society, Louisville, Kentucky, 5 Aug. 1985
(Contract DE-AC05-84OR-21400)
(DE85-016587; CONF-850840-11) Avail: NTIS HC A02/MF A01

The mechanical strength and local chemical properties of alloys are often determined by the presence of grain boundaries in the material. Degradation of these properties is often associated with segregation of arsenic, phosphorus, and other elements to the boundaries. The presence of antimony results in a threefold decrease in the fracture elongation and a threefold increase in the density of intergranular cracks formed during creep deformation. High spatial resolution energy dispersive X-ray spectroscopy (EDXS) was utilized to measure segregation to a variety of boundaries in several aged materials. DOE

N86-14369# Sandia National Labs., Albuquerque, N. Mex. Electron Optics and X-ray Analysis Div.
DYNAMIC SHOCK STUDIES OF VANADIUM
L. C. Chhabildas and C. R. Hills 1985 27 p Presented at EXPLOMET '85 International Conference on Metallurgical Applications of Shock Wave and High Strain-Rate Phenomena, Portland, Oregon, 28 Jul. 1985
(Contract DE-AC04-76DP-00789)
(DE85-017381; SAND-85-0322C; CONF-850770-7) Avail: NTIS HC A03/MF A01

Using gas-gun loading techniques and velocity interferometric techniques, time-resolved wave profiles have been obtained in vanadium over the stress range of 2.9 to 9.7 GPa. The risetime data indicate steepened shock structures with increasing shock amplitude. However, unlike aluminum, finite risetimes are determined even at 9.7 GPa, indicating a large effective viscosity for the material. The dynamic yield strength measured at the Hugoniot elastic limit is 0.8 GPa and is approximately twice the static yield strength. Material softening is evidenced through measurements of shock velocity and yield strength determinations in the shocked state. The yield strength of the material upon release from the shocked state is estimated to be approx. 0.43 GPa and is comparable to the static yield strength. Strain-rate dependent processes may be responsible for a higher elastic shear stress sustained before relaxation to an equilibrium value. The primary mode of deformation in shocked vanadium appears to be cross slip, resulting in dislocation tangles. Deformation twins are also observed in shock-recovered specimens with an increasing number with increased shock stress. The thermal diffusivity for vanadium is low, and the shear-strength loss observed in this material is consistent with the strength loss observed for other materials which also have low thermal diffusivities. It is conceivable that the loss of shear strength may be due to long thermal recovery times resulting from inhomogeneous deformation process. DOE

N86-14370# North Carolina State Univ., Raleigh.
SHOCK SYNTHESIS OF NICKEL ALUMINIDES
I. K. Simonsen, Y. Horie, and R. A. Graham 1985 7 p Presented at the American Physical Society Topical Conference on Shock Waves in Condensed Matter, Spokane, Washington, 22 Jul. 1985 Prepared in cooperation with Sandia Labs., Albuquerque, New Mexico
(Contract DE-AC04-76DP-00789)
(DE85-015164; SAND-85-0483C; CONF-850736-42) Avail: NTIS HC A02/MF A01

Localized formation of solid solutions and NiAl were observed in a specimen subjected to the weakest loading conditions (peak pressure of 5.0 GPa and peak temperature of 250(0)C). This is an indication of greatly enhanced solid state reactivity encountered under shock wave loading. The formation of bulk Ni3Al appears to require a temperature of about 400(0)C, but the reactions are inhibited by high pressures (above 15 GPa). DOE

N86-14371# Sandia National Labs., Albuquerque, N. Mex.
OBSERVATIONS ON THE SHOCK-SYNTHESIS OF INTERMETALLIC COMPOUNDS
Y. Horie, R. A. Graham, and I. K. Simonsen 1985 16 p Presented at EXPLOMET '85 - International Conference on Methods of Applications of Shock Wave and High Strain-Rate Phenomena, Portland, Oregon, 28 Jul. 1985
(Contract DE-AC04-76DP-00789)
(DE85-016815; SAND-85-0485C; CONF-850770-6) Avail: NTIS HC A02/MF A01

Recent studies of chemical reactions under high pressure shock loading involved exothermic binary metallic systems, Ni-Al and Ti-Al. These studies have shown a complex array of simultaneous processes occurring prior to and during the shock pulse induced chemical reactions. This paper examines selected events thought to be important in the shock compression synthesis as shown by optical micrographs in conjunction with X-ray diffraction and electron probe microanalysis. The emphasis in this paper is placed on highlighting mechanisms that are influenced by material properties and configuration. DOE

N86-14372# Westinghouse Research and Development Center, Pittsburgh, Pa.
CREEP OF 304 LN AND 316 L STAINLESS STEELS AT CRYOGENIC TEMPERATURES
L. D. Roth, A. E. Manhardt, E. N. C. Dalder, and R. P. Kershaw, Jr. 7 Aug. 1985 9 p Presented at Cryogenic Engineering Conference and International Cryogenic Materials Conference, Boston, Massachusetts, 12 Aug. 1985 Prepared in cooperation with California Univ., Livermore, Lawrence Livermore Lab.
(Contract W-7405-eng-48)
(DE85-016523; UCRL-93132; CONF-850814-2) Avail: NTIS HC A02/MF A01

Creep behavior of Type 304 LN plate and 316 L shielded-metal-arc (SMA)-deposited stainless weld metal was investigated at 4 K. Testing was performed at constant load in a creep machine with a cryostat designed for long-term stability. Both transient and steady-state creep were observed during tests lasting over 2000 hours. Steady-state creep rates were much greater than expected from extrapolations of 300-K creep data. Creep rates on the order of 10 to the minus 10 power/sec were observed at stresses around the yield stress for both materials. The stress exponent under these conditions if approx. 2.3. Possible creep mechanisms at this temperature and the impact of these results on the design of engineering structures for long-term structural stability at cryogenic temperatures are discussed. DOE

N86-14373# Centre Technique des Industries Mecaniques, Nantes (France).
STUDY OF THE INFLUENCE OF THE RELAXATION HEAT-TREATMENT DURATION ON THE RESILIENCE EVOLUTION OF MULTIPASS WELDINGS IN C-Mn LOW ALLOY STEEL Final

Report [ETUDE DE L'INFLUENCE DE LA DUREE DU PALIER DU TRAITEMENT THERMIQUE DE RELAXATION SUR L'EVOLUTION DE LA RESILIENNE DE SOUDURES MULTIPASSES EN ACIER C-Mn ET FAIBLEMENT ALLIE]
D. Cartaud (Institut de Soudure), S. Debiez (Institut de Soudure), and P. Lecrublier (Institut de Soudure) Nov. 1984 36 p refs In FRENCH
(Contract DGRST-83-2431)
(CETIM-101-090; IS-16-662) Avail: NTIS HC A03/MF A01

The influence of cooling procedure on steel mechanical properties with relaxation time of 24 hr at 600C ending by either water cooling or low velocity cooling at 10C/hr was studied. It is shown that the effect of time extension depends on the metallographic structure and no clear influence is deduced. Author (ESA)

N86-14374# Centre Technique des Industries Mecaniques, Senlis (France).
SURFACE TREATMENTS ON TITANIUM Final Report [GAMMES DE TRAITEMENTS DE SURFACE SUR TITANE]
B. Sutter and J. Reby May 1984 14 p refs In FRENCH
(CETIM-101-200) Avail: NTIS HC A02/MF A01

Surface treatments used to protect titanium from friction and stress corrosion were surveyed. Metal deposition, surface oxydation, ceramic deposition and diffusion thermochemical treatments (carburizing, nitriding) were explored. It is shown that the choice of treatment depends on final application. Plasma projection method applications in the aerospace industry are discussed. Author (ESA)

N86-14375# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Abt. Werkstofftechnologie und Warmfestigkeit.
CORRELATION BETWEEN MICROSTRUCTURE AND FORGING CONDITIONS OF COMBINED DIE FORGE (CDF) TI-6AI-4V POWDER Ph.D. Thesis - Technische Hochschule, Aachen
Wilfried Smarsly May 1985 144 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-952)
(DFVLR-FB-85-29; D-82; ISSN-0171-1342) Avail: NTIS HC A07/MF A01; DFVLR, Cologne DM 47.50

Titanium-6AI-4V alloy powder in a steel can and a copper fluid die was compacted and forged and annealed at 950 C in an extrusion container by a hydraulic press and high velocity hammer using the combined die forging process to investigate its effects on the material porosity and morphology, on the powder alloy texture, and on the microstructure of the forged material. The results are required for development and optimization of a one-operation production procedure for components made of powder materials. The CDF process improves the fatigue properties and is adequate for the manufacturing of thick powder materials with optimal metallurgical microstructure and mechanical properties. Investigations of the ductility, strength and fatigue properties of the powder materials under the combined die forging conditions are recommended. Author (ESA)

N86-14376# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Festkoerperforschung.
IRRADIATION-INDUCED CREEP AND MICROSTRUCTURAL DEVELOPMENT IN PRECIPITATION HARDENED NICKEL-ALUMINUM ALLOYS Ph.D. Thesis - Punjab Univ., Pakistan
M. Iqbal Ansari Apr. 1985 107 p refs Sponsored by German Academic Exchange Service (DAAD) and Kernforschungsanlage (JUEL-1991; ISSN-0366-0885) Avail: NTIS HC A06/MF A01

Irradiation-induced creep in solid-solution Ni-8.5 at% Al and precipitation-hardened Ni-13.1 at% Al alloys was studied by bombarding miniaturized specimens with 6.2 MeV protons at 300 C under different tensile stresses. Results show that the irradiation creep rates of both Ni-Al alloys are only weakly dependent on Al-concentration and pretreatment. Creep rates are comparable with other solution-hardened Ni alloys and commercial stainless steel. Irradiation changes the precipitate structure, and with increasing dose a splitting of the preexisting precipitates into smaller fragments is observed. Irradiation-induced growth of gamma' precipitates in quenched Ni-13.1 at% Al alloys by a displacement rate of 0.000002 dpa/sec at 300 C is comparable to the growth under thermal aging at 570 C. The solubility of Al in Ni is enhanced by irradiation. Author (ESA)

N86-14453# Joint Publications Research Service, Arlington, Va.
ADVANCES IN ANTICORROSIVE COATINGS, CASTING TECHNOLOGY
In its East Europe Report: Science and Technology (JPRS-ESA-85-032) 28 Oct. 1985 p 86-87 Transl. into ENGLISH from Rzeczpospolita (Warsaw), 7-8 Sept. 1985 p 4 (For primary document see N86-14450 05-31)
Avail: NTIS HC A05/MF A01

N86-14920# Cornell Univ., Ithaca, N.Y. Dept. of Theoretical and Applied Mechanics.
BEYOND STEFAN PROBLEMS: THE STRUCTURE OF SHEARED SOLIDIFICATION FRONTS
F. S. Hall and G. S. S. Ludford *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 253-259 (For primary document see N86-14902 05-59)
(AD-P004919) Avail: NTIS HC A99/MF E03

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N86-14377# National Academy of Sciences - National Research Council, Washington, D. C. Committee on Mineral Resources Technology.
AN ASSESSMENT OF THE CERAMICS RESEARCH AND DEVELOPMENT EFFORTS OF THE BUREAU OF MINES
1984 43 p refs
(DI-BM-J0-100106)
(NMAB-410-4) Avail: NTIS HC A03/MF A01 CSCL 11B

This report assesses the ceramics research and development efforts of the Bureau of Mines. It reflects the findings of a working group of the Committee on Mineral Resources Technology that visited the Bureau's Tuscaloosa Research Center. Included are comments on organization, budget, personnel, major experimental methods, and equipment and facilities. The utility of current ceramics research projects is also examined. B.W.

N86-14378# Aerospace Corp., El Segundo, Calif. Chemistry and Physics Lab.
FINITE-DIFFERENCE NUMERICAL ANALYSIS OF PHASE-BOUNDARY REACTION MODELS FOR CESIUM PENETRATION INTO GLASS
R. P. Frueholz and M. Wun-Fogle 24 Jun. 1985 30 p
(Contract F04701-83-C-0084)
(AD-A158513; TR-0084A(5472-03)-1; SD-TR-85-17) Avail: NTIS HC A03/MF A01 CSCL 07/4

Experimental data for the phase-boundry reaction and subsequent diffusion occurring when glass surfaces are exposed to aqueous cesium (Cs) have been theoretically analyzed. Partial differential equations resulting from a surface reaction followed by three possible modes of penetration: (1) simple diffusion; (2) interdiffusion; and (3) double diffusion of Cs, were numerically solved by means of a finite-difference technique. A model in which aqueous Cs+ is assumed to react rapidly with a time-dependent number of glass surface sites, followed by double-diffusion penetration, produced the best agreement with experiment. The Cs diffusion coefficients of 2 x 10 to the -16th power and 3 x 10 to the -17th power sq cm/s were obtained. The value of the finite-difference solution technique is also discussed. Author (GRA)

N86-14379# Ultrasystems, Inc., Irvine, Calif.
BORON-NITROGEN POLYMERS Final Report, 1 Jul. 1982 - 30 Jul. 1985
K. L. Paciorek, D. H. Harris, R. H. Kratzer, M. E. Smythe, and P.

F. Kimble 1 Jul. 1985 3 p
(Contract N00014-82-C-0402)
(AD-A158658; SN-2022-F) Avail: NTIS HC A02/MF A01 CSCL 11/2

The objective was to develop processible preceramic polymers amenable to transformation into pure boron nitride for potential applications as fibers and coatings. A series of alkyl, aryl, and trimethylsilyl-substituted borazines was synthesized and subjected to pyrolysis to determine the type of substituent leading to an optimum preceramic polymer. The feasibility of the process was established. From trimethylsilyl-substituted precursors, following stepwise pyrolysis, fibers were drawn and cured in an ammonia atmosphere giving pure boron nitride. Mechanisms responsible for borazine condensations were elucidated; processes involved in precursor synthesis were investigated. GRA

N86-14380# Massachusetts Inst. of Tech., Cambridge. Dept. of Chemical Engineering.
CONDENSATION POLYMERS WITH CONTROLLED STRUCTURE Annual Report
U. W. Suter 14 Aug. 1985 9 p
(Contract N00014-85-K-0161)
(AD-A158675; AR-1) Avail: NTIS HC A02/MF A01 CSCL 11/9

This report details the progress made and work currently being undertaken on the project Condensation Polymers with Controlled Structure. Growth has taken place in areas of: polymer synthesis with controlled constitution, monomer preparation, polymer characterization and theoretical understanding of polymer properties. The project's objective is to develop new rigid-rod polyamides with a controlled and preselectable degree of constitutional regularity. The reason behind this approach is the fact that condensation polymers that contain units whose mutual orientation can be distinguished give rise to consitutional isomerism similar to the head/tail isomerism in vinyl polymers. Regular polymers are characterized by structures containing either only head-to-tail or only head-to-head/tail-to-tail structures. This isomerism has been found to influence the properties of many polycondensates significantly. At present, no molecular theory of the properties of condensation polymers exists and the mechanisms by which properties differ are largely unknown, but one might conjecture that crystallinity and intermolecular cohesion are both important factors. We have selected a polymer system that depends largely upon interchain interactions. The one which we have selected to begin our study on are substituted wholly aromatic polyamides or, as they are often referred to as, aramides. GRA

N86-14381# Cincinnati Univ., Ohio. Dept. of Materials Science and Metallurgical Engineering.
PHASE RELATIONS IN MULTICOMPONENT POLYMER SYSTEMS Final Report, 1 Jun. 1977 - 31 Aug. 1985
R. J. Roe 31 Aug. 1985 8 p
(Contract N00014-77-C-0376)
(AD-A158900) Avail: NTIS HC A02/MF A01 CSCL 11/9

In this project a number of polymer blend systems were studied to find the thermodynamic factors controlling the compatibility, such as the temperature, concentration, molecular weight and the copolymer composition, etc. Topics investigated include: the polymer-polymer interaction parameter between polystyrene and polybutadiene was determined, and the applicability of mean field theories (Flory-Huggins theory and the equation-of-state theory) to the polymer miscibility was ascertained. The feasibility of determining the thickness of interfaces between dissimilar polymers by means of small-angle X-ray scattering was critically examined. The occurrence of the order-disorder transition in block copolymer system were investigated. Light scattering and small-angle X-ray scattering were utilized to study the phase transition and phase separation behavior of mixtures of a homopolymer and a block copolymer, and this led to the construction of phase diagrams which exhibit many new features not found with other types of polymer blends. Deuteration of polystyrene was found not to influence its miscibility with polybutadiene. The effectiveness of a random or block copolymer as a compatibilizer of homopolymer blends was investigated. The effect of molecular weight polydispersity on the cloud point curves of polymeric blends was investigated. GRA

N86-14382# Rockwell International Science Center, Thousand Oaks, Calif. Science Center.
STRENGTHENING AND STRENGTH UNIFORMITY OF STRUCTURAL CERAMICS Final Report, 1 Feb. 1981 - 31 Jan. 1985
F. F. Lange and D. B. Marshall Apr. 1985 110 p
(Contract F49620-81-C-0036)
(AD-A159170; SC5295.4FR; AFOSR-85-0731TR) Avail: NTIS HC A06/MF A01 CSCL 11/2

The results of a four year study aimed at improving the strength and reliability of structural ceramics are summarized. Strength-degrading flaw populations were identified and processing methods were developed to eliminate each flaw population, thereby increasing the strength of Al2O3-ZrO2 composites by a factor of three. The final year's work, which is reported in detail here, concentrated on the introduction of beneficial surface stresses by grinding, identification of strength-controlling characteristics of transformation toughened ceramics, and manipulation of microstructure by controlling grain growth. Requirements for inhibition of grain growth by several phase particles (particle size, volume fraction) were identified and grain-size control in transformation toughened materials was achieved by sintering in a two-phase field. Author (GRA)

N86-14383# Massachusetts Inst. of Tech., Cambridge. Dept. of Electrical Engineering and Computer Science.
WLF (WILLIAMS-LANDEL-FERRY) DEPENDENCE OF THE DIELECTRIC PROPERTIES OF DGEBA (DIGLYCIDYL ETHER OF BISPHENOL-A) EPOXY RESINS Technical Report, 1 May 1984 - 31 Aug. 1985
N. F. Sheppard, Jr. and S. D. Senturia 23 Aug. 1985 34 p
(Contract N00014-84-K-0274)
(AD-A159224; TR-3) Avail: NTIS HC A03/MF A01 CSCL 11/9

The frequency and temperature dependence of the complex dielectric constant (Epsilon) of seven diglycidyl ether of bisphenol-A (DGEBA) epoxy resins having epoxide equivalent weights (EEW) in the range 175 to 1880 have been measured from T subscript -30 C to T subscript + 70 C at frequencies between 0.1 and 10,000 Hz. In the vicinity of T subscript g, Epsilon is dominated by dipole relaxation, while at higher temperatures ionic conductivity dominates. For all resins, the temperature dependences of the frequency of maximum dipole loss, fmax, and of the conductivity, sigma, obey the Williams-Landel-Ferry (WLF) equation. The WLF constants C subscript 1 and C subscript 2 were determined for both the fmax and sigma data for each of the resins. In a given material, the WLF constants for sigma and fmax differed, indicating that the temperature dependences of the mobilities of ionic impurities and permanent dipole moments differ quantitatively. As the EEW of the material increased, the C subscript 1 values determined for the conductivity at high EEW's, while the corresponding C subscript 2 constants decreased slightly. Free volume and entropic theories of the glass transition are used to interpret these results in terms of the underlying conduction and dipole relaxation processes. Author (GRA)

N86-14384# Los Alamos National Lab., N. Mex.
EFFECT OF POLYMER MORPHOLOGY ON PROTON AND WATER TRANSPORT THROUGH IONOMERIC POLYMERS
J. L. Fales, T. E. Springer, N. E. Vanderborgh, and P. Stroeve 1985 17 p Presented at the 167th Electrochemical Society Meeting, Toronto, Ontario, Canada, 12 May 1985 Prepared in cooperation with California Univ., Davis
(Contract W-7405-eng-36)
(DE85-014086; LA-UR-85-2212; CONF-850542-5) Avail: NTIS HC A02/MF A01

The rate of ionic transport through perfluorosulfonic acid membranes is set by water content within mass transfer channels of the polymer. Consequently, control of water flux is important to control transport rates. Experiments show the influence of cation type on water transport properties and on polymer physical

properties. These results support the model that channel geometries are determined by the interaction of coulombic forces within the membrane. Description of these transport processes is accomplished through several mathematical routes. DOE

N86-14385# Du Pont de Nemours (E. I.) and Co., Aiken, S.C.
GLASS/METAL INTERACTIONS, LEACHING, WASTE GLASS, CANISTER MATERIAL
D. B. Burns, B. H. Upton, and G. G. Wicks Jan. 1985 72 p
(Contract DE-AC09-76SR-00001)
(DE85-015825; DPST-85-217) Avail: NTIS HC A04/MF A01

A series of glass/metal leaching experiments have been conducted to evaluate the effects of potential metal canister and metal overpack materials on the durability of SRP waste glass. A modified leaching test, based upon standard MCC-1 leaching procedures, was used. The metals studied included: low carbon steel, ferritic steel, austenitic steel, a titanium based alloy, lead, Inconel 600, and E-Brite. The simulated SRP waste glass system studied was 131/TDS waste glass, a glass system with the most extensive data base available. At the conclusion of the test, leachate samples were analyzed for key elements in solution, and the surfaces of the metal and glass samples were examined for microstructural changes. DOE

N86-14386# Oak Ridge National Lab., Tenn.
SURFACE PROPERTY MODIFICATION OF CERAMICS BY ION BEAMS
C. J. McHargue, G. C. Farlow, C. W. White, B. R. Appleton, J. M. Williams, P. S. Sklad, P. Angelini, and C. S. Yust 1985 11 p Presented at the American Society for Metals Conference on Applications of Ion Plating and Implantation to Materials, Atlanta, Georgia, 3 Jun. 1985
(Contract DE-AC05-84OR-21400)
(DE85-016368; CONF-8506139-2) Avail: NTIS HC A02/MF A01

The surface mechanical and chemical properties of ion implanted ceramics reflect changes in the microstructure produced by the bombarding ions. Metastable solid solutions which contain large concentrations of lattice defects have been produced in Al2O3, SiC, and TiB2. Such structures exhibit a higher microindentation hardness, fracture toughness, and wear resistance than unimplanted materials. Amorphous surfaces have been formed on Al2O3 and SiC crystals by low temperature, high fluence, or certain ion species implantation. These surfaces have a lower hardness but higher toughness than unimplanted crystals. DOE

N86-14387# Oak Ridge National Lab., Tenn.
TOUGHENING OF CERAMICS BY WHISKER REINFORCEMENT
P. F. Becher, T. N. Tiegs, J. C. Ogle, and W. H. Warwick 1985 15 p Presented at the 4th International. Symposium on the Fracture Mechanics of Ceramics, Blacksburg, Virginia, 18 Jun. 1985
(Contract DE-AC05-84OR-21400)
(DE85-016371; CONF-8506128-3) Avail: NTIS HC A02/MF A01

These studies focus on improvements in the mechanical performance of ceramics by consideration of composite toughening approaches. Analysis of toughening processes indicated that both crack deflection and whisker pull out mechanisms can contribute to the fracture toughness of ceramics which contain strong small diameter whiskers. Results show that these processes can indeed yield high toughness in SiC whisker reinforced ceramics. DOE

N86-14388# Connecticut Univ., Storrs. Dept. of Chemical Engineering.
OXYGEN ENRICHMENT OF AIR USING SEMIPERMEABLE MEMBRANES IN A MAGNETIC FIELD Final Report, 15 Jan. 1983 - 14 Jan. 1985
1985 86 p
(Contract DE-FC07-83ID-12430)
(DE85-017032; DOE/ID-12430/T1) Avail: NTIS HC A05/MF A01

The use of semipermeable membranes to enrich oxygen from air has recently drawn a great deal of interest, particularly for combustion and medical applications. The maximum possible oxygen enrichment of air using silicone membranes is approximately 50%. By applying a nonuniform magnetic field to the membrane system, the paramagnetic properties of oxygen in theory may be used to achieve increased enrichment. Four magnetic test cells were developed to induce nonuniformity in a magnetic field of 15 Kilogauss. Three membranes were evaluated on these test cells: dimethyl silicone, dimethyl silicone/polycarbonate copolymer (MEM-213), and cellulose acetate. The evaluation consisted of determining the oxygen flux at various pressure differences across the membrane. The tests were run at room temperature and pressure, both in and out of the magnetic field. The 15 Kilogauss magnetic field currently available to us produced negligible increases in the oxygen concentration with all pole pieces. A mathematical model was developed which showed that fields of 200 to 400 Kilogauss are needed to get enrichments of 0.5% and to overcome the reverse polarization (concentration diffusion) of oxygen built up next to the membrane. Fluxes in this range have been experimentally achieved but are not currently commercially available. This additional oxygen would cost 800 times more than currently available pure oxygen. DOE

N86-14389# California Univ., Berkeley. Lawrence Berkeley Lab.
AEROGEL: A TRANSPARENT INSULATOR FOR SOLAR APPLICATIONS
A. J. Hunt, R. E. Russo, P. H. Tewari, and K. D. Lofftus Jun. 1985 8 p Presented at the INTERSOL Conf. on Solar Energy, the Diverse Solution, Montreal, Canada, 23 Jun. 1985
(Contract DE-AC03-76SF-00098)
(DE85-016551; LBL-19271; CONF-850604-16) Avail: NTIS HC A02/MF A01

Aerogel is a transparent, low density, insulating material suitable for a variety of solar applications. Significant energy savings can be realized by using aerogel for a window glazing material. Other possible applications include solar collector covers, transparent insulating jackets for direct gain passive solar devices, and situations that require both transparency and good insulation. Because silica aerogel has a low density (2 to 10% solid), it has a thermal conductivity as low as 0.014 W/m K without evacuation, and if evacuated, lower than 0.006 W/m K. It provides a clear view with only slight coloring due to its weak and nearly isotropic scattering of light. This paper describes significant progress made in the past year at our laboratory in the development of aerogel. We have improved the transparency, developed new preparation methods using less toxic materials, and initiated successful experiments in drying alcogels at near ambient temperature. Optical transmission, light scattering, and electron microscopy data show that CO2 supercritical drying of alcogels produces aerogels similar in quality to those produced by high temperature supercritical drying. Author

N86-14390# Fermi National Accelerator Lab., Batavia, Ill.
INVESTIGATION OF THE SKIN DEPTH EFFECT OF A METALLIC COATING ON A CERAMIC BEAMPIPE INSIDE A KICKER
K. Y. Ng Jul. 1985 17 p
(Contract DE-AC02-76CH-03000)
(DE85-017362; FNAL-TM-1341) Avail: NTIS HC A02/MF A01

Inside a kicker magnet, metallic beampipe cannot be used because it will screen off the rapid rising of the kicker's magnetic field. When a ceramic beampipe is used, one usually coats the inside with a thin layer of metal so as to carry at least part of the beam's image current and to prevent static charge buildup. The purpose of this article is to investigate whether such a coating will alter the risetime constant of the magnetic field significantly, whether such a coating can withstand the strong transient current induced by the fast rising magntic field, and whether the back magnetic field generated by this transient current is strong enough to upset the designed risetime of the kicker. DOE

N86-14391# Brookhaven National Lab., Upton, N. Y.
FURFURYL ALCOHOL POLYMER CONCRETES FOR USE IN ALL-WEATHER REPAIRS OF CONCRETE AND ASPHALT SURFACES
L. E. Kukacka and T. Sugama Apr. 1985 26 p Presented at the

American Concrete Institute Fall Meeting on Polymers in Concrete, Chicago, Illinois, 3 Oct. 1985
(Contract DE-AC02-76CH-00016)
(DE85-014825; BNL-36465; CONF-8510115-1) Avail: NTIS HC A03/MF A01

The following criteria were established: high strength at an age of 1 h, placement of the materials must be possible during heavy precipitation over temperatures ranging from -32 to 52 C, and the chemical constituents should be low cost and have long-term stability when contained in a maximum of three packages during storage. A formulation consisting of furfuryl alcohol monomer (FA), (ALPHA), (ALPHA), (ALPHA) - trichlorotoluene, pyridine, silane, zinc chloride, silica filler, and coarse aggregate meets these requirements. Optimized formulations were established for use with premixed and percolation placement methods. The premixed formulation is compatible with moisture contents up to 4% by weight of the total mass, which simulates placement in a 2.54 cm/h rainfall. The working time for the FA-PC slurry can be controlled at greater than or equal to 15 min over the entire operating temperature range by simply varying the (ALPHA), (ALPHA), (ALPHA)-trichlorotoluene catalyst concentration while holding all of the other constituents constant. Prototype equipment for the mixing and placement of FA-PC was demonstrated: a concrete transit mix supply of mixed aggregate, a hopper-fed volumetric feed screw which supplied aggregate at a known rate to a mixing screw, and a monomer pump and spray nozzle. DOE

N86-14392# Centre Technique des Industries Mecaniques, Senlis (France).
DROP SIZE MEASUREMENT AND SIZE DISTRIBUTION IN SPRAYED PAINT DROPS Final Report [GRANULOMETRIE DES GOUTTELETTES DE PEINTURES PULVERISEES ET MESURE]
S. Verney Dec. 1984 26 p refs In FRENCH
(CETIM-102-750) Avail: NTIS HC A03/MF A01

Literature on paint drop size distribution and measurement was surveyed. The formulas giving the dispersion, average diameters, and distribution functions are discussed. The influence of several parameters on the spraying is examined. The parameters characterizing a sprayer are enumerated. Experimental methods are reviewed. A clear advantage of one particular method is not found, although the technical superiority of laser beam diffusion is recognized. Author (ESA)

N86-14410# Osaka Univ. (Japan). Dept. of Electrical Engineering.
MECHANICAL AND ELECTRICAL PROPERTIES OF ELECTROCHEMICALLY PREPARED CONDUCTING POLYMERS
Katsumi Yoshino, Munchiro Tabata, Masaharu Satoh, Keiichi Kaneto, and Toshiyuki Ohsawa *In its* Technology Reports of the Osaka University, Vol. 35, Nos. 1800-1818 Oct. 1985 p 231-236 refs (For primary document see N86-14405 05-31)
Avail: NTIS HC A09/MF A01

N86-14442# Joint Publications Research Service, Arlington, Va.
LINEAR EXPANSION OF POLYURETHANE FOAM AT LOW TEMPERATURE
Xian Zhu, Yongfu Ji, Jianke Zhang, Pingxian Bai, and Yuanzhou Han *In its* China Report: Science and Technolgy (JPRS-CST-85-033) 30 Sep. 1985 p 90-97 refs Transl. into ENGLISH from Yuhang Xuebao (Beijing), no. 4, 31 Oct. 1984 p 98-103 (For primary document see N86-14438 05-31)
Avail: NTIS HC A06/MF A01

N86-14444# Joint Publications Research Service, Arlington, Va.
STRUCTURE OF NYLON 1010 DESCRIBED
Xiaozhen Yang, Shiru Hu, Yafei Lu, Shannong Zhu, and Xiangkui Li *In its* China Report: Science and Technology (JPRS-CST-85-036) 23 Oct. 1985 p 19-26 refs Transl. into ENGLISH from Gaofenzi Tongxun (Beijing), no. 3, Jun. 1985 p 202-206 (For primary document see N86-14443 05-31)
Avail: NTIS HC A07/MF A01

N86-14476*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE NUMBER OF STABLE POINTS OF AN INFINITE-RANGE SPIN GLASS MEMORY
R. J. McEliece (California Inst. of Tech.) and E. C. Posner *In its* The Telecommunications and Data Acquisition Report 15 Nov. 1985 p 209-215 refs (For primary document see N86-14457 05-32)
Avail: NTIS HC A10/MF A01

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N86-14393# Drexel Univ., Philadelphia, Pa. Dept. of Mechanical Engineering and Mechanics.
PREIGNITION OXIDATION CHARACTERISTICS OF HYDROCARBON FUELS Final Report, 15 Apr. 1980 - 14 Oct. 1984
N. P. Cernansky, R. S. Cohen, and R. D. Wilk Jul. 1985 120 p
(Contract DAAG29-80-C-0112)
(AD-A158442; ARO-16957.6-EG) Avail: NTIS HC A06/MF A01 CSCL 21/4

A research program to study the preignition oxidation characteristics of hydrocarbon fuels has been carried out. A static reactor test facility and gas chromatographic analysis techniques were used to assess the preignition oxidation chemistry by determining the stable reaction intermediates and products formed during the preignition process. Comprehensive studies were made of the oxidation of propane and propene at low and intermediate temperatures (550 to 750 K) and at subatmospheric pressures. The experimental results for each of these fuels demonstrated a clear transition in the oxidation chemistry from a low temperature regime to an intermediate temperature regime, separated by a region of negative temperature coefficient. The main characteristics and features of the oxidation mechanisms were determined for each fuel in each temperature regime. Increasing the vessel surface-to-volume ratio had the effect of enhancing heterogeneous termination, but did not affect the main reaction paths of the mechanism. The experimental results for propene were used to modify and extend the high temperature mechanism of Westbrook and Pitz to low and intermediate temperatures. Studies were also made of the preignition behavior of dodecane and binary mixtures of dodecane and the aromatic component tetraline. Addition to the tetralin to dodecane had the overall effect of decreasing the ignition tendency, although the magnitude of this effect was not proportional to the amount added. Author (GRA)

N86-14394# Northwestern Univ., Evanston, Ill. Dept. of Mechanical Engineering.
ORGANIC AZIDES AS JET FUEL ADDITIVES Final Report
C. K. Law 20 May 1985 12 p
(Contract N00014-83-K-0207)
(AD-A159201) Avail: NTIS HC A02/MF A01 CSCL 21/4

Under the sponsored program an experimental investigation has been conducted on the vaporization and combustion characteristics of freely-falling droplets of organic azides in hot oxidizing or inert environments. The droplets of organic azides in hot oxidizing or inert environments. The droplet burning rate and the state of micro-explosion have been measured. Results show that, compared with the conventional hydrocarbon fuels, droplets of azido fuels burn faster and micro-explode earlier in the droplet lifetime. The effect is especially strong for diazido n-alkanes whose gasification rates can be several hundred percent of the corresponding n-alkanes. Such strong responses are postulated to be caused by dissociative gasification with very low heat of gasification. GRA

N86-14395# Naval Research Lab., Washington, D. C. Lab. for the Structure of Matter.
THE STRUCTURAL CHEMISTRY OF ENERGETIC COMPOUNDS Annual Progress Report, 1 Oct. 1983 - 1 Oct. 1984
R. Gilardi and C. George 1 Oct. 1984 47 p
(NR Proj. RR0-2402)
(AD-A159203) Avail: NTIS HC A03/MF A01 CSCL 07/4

Structural characterization of 12 energetic materials and precursoprs by X-ray diffraction was performed. The materials examined include: 6,6,10, 10-tetranitropentacyclo(5.3.02,5.03,9.04,8) decane; 2,6-Diamono-3,5-dinitro-1,4-pyrazine; 4,4,8,8-tetranitro-bicyclooctane; 2,3,4-Trinitropyrrole; 1,3,5-Trinitroso-1,3,5-triazacyclohexane; 3,3-Bis(methyl-nitroaminomethyl)oxetane; 3,3-Bis(nitratomethyl)-oxetane; 3-Methoxy-2,4-dinitro-2,4-diazapentane; Tri-benzyltriazawurtzitane;
n-oxide; 5-Aza-6-methoxyiracil; and N-(4-amino-1,2,5-triazolo)-N-methoxy-trichloroacetamidine. The compounds studied range in density from 1.175 mg/cu mm (tri-benzyl-triazawurtzitane) to 1.856 mg/cu mm (trinitropyrrole) and four have crystal densities in the range 1.717 to 1.856 mg/cu mm. GRA

N86-14396# California Univ., Berkeley. Lawrence Berkeley Lab.
DIRECT RADIANT HEATING OF PARTICLE SUSPENSIONS FOR THE PRODUCTION OF FUELS AND CHEMICALS USING CONCENTRATED SUNLIGHT
A. J. Hunt, J. Ayer, P. Hull, F. Miller, R. E. Russo, and W. Yuen Jun. 1985 9 p Presented at INTERSOL 1985 - Solar Energy: the Diverse Solution, Montreal, Canada, 23 Jun. 1985 Prepared in cooperation with California Univ., Santa Barbara
(Contract DE-AC03-76SF-00098)
(DE85-016548; LBL-19842; CONF-850604-14) Avail: NTIS HC A02/MF A01

Recent advances in a research program to understand the behavior of radiantly heated gas-particle suspensions are described. The research is investigating the use of gas-particle suspensions to absorb concentrated sunlight to supply energy for endothermic chemical reactions. The analytical section includes the description of a chemical survey, the results of optical calculations, and a summary of heat transfer studies. The experimental section outlines the current laboratory studies of direct radiant heating that utilize a high intensity radiant source to simulate concentrated sunlight. This work is aimed at establishing a technology base supporting new applications of concentrated sunlight for the production of useful fuels and chemicals. DOE

N86-14397# Union Rheinische Braunkohlen Kraftstoff A.G., Wesseling (West Germany).
CONVERSION OF METHANOL TO GASOLINE. OPERATION OF THE DEMONSTRATION PLANT, MILESTONE REPORT
M. Edwards, H. Gierlich, R. Gould, and N. Thiagarajan Aug. 1985 130 p
(Contract DE-FC01-80ET-14914)
(DE85-017046; DOE/ET-14914/1) Avail: NTIS HC A07/MF A01

The 100 BPD fluid-bed methanol to gasoline (MTG) demonstration plant operation exceeded the original process objectives. Specifically, the results show: stable unit operation is achieved with excellent gas/catalyst mixing resulting in complete methanol conversion; bed temperature control is readily accomplished, although the process is highly exothermic; catalyst attrition is low, which confirms the mechanical strength of the catalyst - the small make-up used for activity control at normal conditions exceeds the low attrition rate; process parameters can be varied to obtain the desired gasoline yield and quality; and engineering design parameters have been confirmed at the pilot plant stage and a scale-up to a commercial-size MTG fluid-bed system is now deemed feasible. The results obtained gave a broad basis for the conceptual design of a coal-based commercial-size plant for the production of MTG gasoline. The conceptual design will be based on a 2500 tonnes/day methanol plant feeding a single MTG fluid-bed reactor. Six trains will be used for a maximum plant capacity of 15,000 tonnes/day. DOE

N86-14398# Sandia National Labs., Albuquerque, N. Mex.
THEORETICAL EQUATIONS OF STATE FOR THE DETONATION PRODUCTS OF EXPLOSIVES
G. I. Kerley 1985 6 p refs Presented at the 8th International Symposium on Detonation, Albuquerque, New Mexico, 15 Jul. 1985
(Contract DE-AC04-76DP-00789)
(DE85-014700; SAND-85-1545C; CONF-850706-26) Avail: NTIS HC A02/MF A01

Equations of state (EOS) for the detonation products of explosives are calculated from EOS for the individual chemical species, using the approximation of ideal mixing. The theory is applied to 15 explosives, and it is necessary to identify the important reaction products and to determine their EOS parameters. For explosives that contain no carbon or are oxygen-rich, the principal species and their EOS are known reasonably well, and the theory gives good results. For carbon-rich explosives, it is found that formic acid competes with carbon as a reaction product. If formic acid is omitted from the equilibrium, the data for PETN and RDX cannot be fit with any reasonable modification to the carbon EOS. An EOS for formic acid is constructed, and the theory gives good results for all classes of CHNO explosives. DOE

N86-14399# California Univ., Berkeley. Lawrence Berkeley Lab.
SOLAR RADIANT PROCESSING OF GAS-PARTICLE SYSTEMS FOR PRODUCING USEFUL FUELS AND CHEMICALS
A. J. Hunt, J. Ayer, P. Hull, F. Miller, R. E. Russo, and W. Yuen Jun. 1985 9 p Presented at the National Heat Transfer Conference, Denver, Colorado, 4 Aug. 1985
(Contract DE-AC03-76SF-00098)
(DE85-016550; LBL-19102; CONF-850810-24) Avail: NTIS HC A02/MF A01

This paper reviews the research program at LBL studying direct radiant heating for the production of fuels and chemicals. The research is investigating the use of gas-particle suspensions to absorb concentrated sunlight to supply energy for endothermic chemical reactions. The goal of the research is to understand the optical, thermodynamic, and chemical processes in solar heated particle suspensions through a balanced program of analytical and experimental investigations. The use of small particles as solar absorbers is discussed and spectral extinction efficiencies are calculated from Mie theory for various particle sizes. An equation for calculating the heat transfer from a particle to the surrounding gas at arbitrary Knudsen number is developed. The experimental section outlines the current laboratory studies of direct radiant heating that utilizes a high intensity radiant source to simulate concentrated sunlight. Some preliminary experimental results are presented. DOE

N86-14400# New York Univ., New York. Mathematics and Computing Lab.
APPLICATIONS OF FRONT TRACKING TO COMBUSTION, SURFACE INSTABILITIES AND TWO DIMENSIONAL RIEMANN PROBLEMS
B. Bukiet, C. L. Gardner, J. Glimm, J. Grove, J. Jones, O. A. McBryan, R. Menikoff, and D. H. Sharp Aug. 1985 29 p Prepared in cooperation with Los Alamos National Lab., N. Mex.
(Contracts DE-AC02-76ER-03077; W-7405-eng-36)
(DE85-017393; DOE/ER-03077/266) Avail: NTIS HC A03/MF A01

The method of front tracking is applied to problems involving curved detonation fronts, surface instabilities and two-dimensional Riemann problems. The detonation problems include detonation fronts with and without cylindrical symmetry; comparisons with one-dimensional models are made. The analysis of interface instabilities focuses on the compressible Rayleigh-Taylor instability of a supersonic accelerated contact discontinuity between two gases and the propagation of a supersonic slab jet. Theoretical notions for an S matrix theory for general multi-dimensional hyperbolic conservation laws and the numerical implementation of computer programs which solve certain two-dimensional Riemann problems are also discussed. DOE

N86-14401# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
SPHERICALLY CONVERGING DETONATION WAVES [SPHAERISCH KONVERGIERENDE DETONATIONSWELLEN]
Kunio Terao Dec. 1984 27 p refs In GERMAN
(MPIS-17/1984; ISSN-0436-1199) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 15

Spherically converging detonation waves were experimentally investigated in a stochiometric propane-oxygen mixture in a hemispherical space with an inner diameter of 800 mm. The propagation velocity, the peak pressure P1 of the detonation front, as well as the pressure Pr behind the reflected shock waves measured as a function of the radial distance from the focus show the same tendencies as in a smaller apparatus (inner diameter 360 mm), namely r proportional to t to the power (-0.82 + or - 0.4), P1/Po proportional to r to the power (-1.1 + or - 0.2), and Pr/Po proportional to r to the power (-1.5 + or - 0.2), where t is the time before focusing and Po is the initial pressure. The exponents of r are much larger than the theoretical values; P1/Po and Pr/Po increase with the diameter of the convergence space. Author (ESA)

N86-14402# Motoren- und Turbinen-Union Muenchen G.m.b.H. (West Germany).
DEVELOPMENT OF NEW COMBUSTOR TECHNOLOGIES FOR APPLICATION TO ALTERNATIVE AEROENGINE FUELS, PHASE 1 Final Report, Dec. 1983
Burkhard Simon Bonn Bundesministerium fuer Forschung und Technologie Jun. 1985 95 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-85-004; ISSN-0170-1339) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 20

An air blast fuel injection system for alternative fuels was developed and tested in a reversed flow annular combustion chamber. It was adapted to the boundary conditions of the jet engine (size, form, thermodynamical data). A wall temperature computational program was developed taking into account the impact of the various fuels on the wall temperatures. Recommendations are made for further investigation of an optimal chamber, the introduction of improved cooling techniques, the influence of fuels on the chamber and the application of the air blast injector with alternative flame tube shapes. Author (ESA)

N86-14403# Fraunhofer-Inst. fuer Treib- und Explosivstoffe, Pfinztal-Berghausen (West Germany).
SILVER JUBILEE CELEBRATION OF THE FRAUNHOFER INSTITUTE FOR FUELS AND EXPLOSIVES ON 26 JUNE, 1984. TWENTY-FIVE YEARS FROM 1959 TO 1984 [25 JAHRE 1959-1984. FESTVERANSTALTUNG 26, JUNI 1984. REDEN UND ANSPRACHEN]
1985 41 p In GERMAN
Avail: NTIS HC A03/MF A01

The history of the Fraunhofer institute; safety devices for explosive systems; environment simulation and transport loads; energy transformation for regenerative energy systems; propellants; internal ballistics; combustion and detonation processes; fuel air explosives; resin lifetime under damaging gas loads; composite solid fuel propellants; electronics and macromolecular chemistry for explosive development; and NATO's deterrence theory and nuclear strategy are discussed. Author (ESA)

N86-14404# Institut Franco-Allemand de Recherches, St. Louis (France).
EXPERIMENTAL STUDY OF THE PERFORMANCE OF NUCLEI GENERATION CHARGES AT A DISTANCE OF UP TO 1000 CALIBERS [ETUDE EXPERIMENTALE DES PERFORMANCES DE CHARGE GENERATRICES DE NOYAUX A UNE DISTANCE D'ACTION DE 1000 CALIBRES]
F. Jamet 21 Jun. 1984 60 p refs In FRENCH
(Contract ETBS-84-02-041)
(ISL-R-114/84) Avail: NTIS HC A04/MF A01

Spherical surfaces in copper tantalum and iron, with 45 mm diameter were transformed into projectiles by the explosion of TNT 35/RDX 65. The explosive body length was 60 mm. The projectiles are elongated up to 2 or 3 diameters and may break. Initial velocity is between 1200 and 2600 m/sec. The flight is unstable and up to 37% of the initial velocity is lost in a 1000 diameter flight. The penetration in a 50 mm steel target is up to 0.4 diameters. Author (ESA)

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N86-14405# Osaka Univ. (Japan). Faculty of Engineering.
TECHNOLOGY REPORTS OF THE OSAKA UNIVERSITY, VOLUME 35, NOS. 1800-1818
Oct. 1985 182 p refs
(ISSN-0030-6177) Avail: NTIS HC A09/MF A01

Technology Reports of the Faculty of Engineering of Osaka (Japan) University, October 1985, discusses topics under the following general categories: Mathematics and Physics; Electrical and Electronic Engineering; Mechanical Engineering; Civil, Architectural and Environmental Engineering, and Naval Architecture; and Chemistry and Biology. Of special interest are articles on the effect of a strong magnetic field on semiconductors, the use of a laser in a fiber optic fluid mechanics measurement system, and numerical calculation of the thermal loading of structural members. For individual titles, see N86-14406 through N86-14417.

N86-14406# Kinki Univ., Kure (Japan). Dept. of Industrial Engineering.
STOCHASTIC LOCATION PROBLEM OF EMERGENCY SERVICE FACILITY **c66**
Tatsuo Matsutomi, Hiroaki Ishii (Osaka Univ.), and Toshio Nishida (Osaka Univ.) *In* Osaka Univ. Technology Reports of the Osaka University, Vol. 35, Nos. 1800-1818 Oct. 1985 p 157-166 refs (For primary document see N86-14405 05-31)
Avail: NTIS HC A09/MF A01

The problem of the location of an emergency service facility is considered under the assumption that location of incidents or demand points are random variables. Two types of problems are formulated as chance constrained programming problems, in which a probability level alpha is considered to be a decision variable. In the first problem distance only is introduced into contraint as a criterion performance of emergency services. Moreover an account is taken of the treatment of time which is also a random variable in addition to distances in the second m. Author

N86-14407# Mitsui Bank, Tokyo (Japan). Systems Development Dept.
POWER OF SOMETIMES-POOL TEST PROCEDURES FOR FIXED EFFECT MODEL **c65**
Nobuo Ihara, Katsuji Uosaki (Osaka Univ.), and Masao Tasaka (Kobe Univ. of Commerce) *In* Okaka Univ. Technology Reports of the Osaka University, Vol. 35, Nos. 1800-1818 Oct. 1985 p 167-175 refs (For primary document see N86-14405 05-31)
Avail: NTIS HC A09/MF A01

The power of the sometimes-pool test procedure is studied for the fixed effect model. The probability of a type I error and the power of the sometimes-pool test procedure are evaluated using the exact formulas for several parameter sets, especially for the case where the degrees of freedom of treatment is 1, and the results are compared with those of the never-pool test procedure. Some recommendations are made for performing the sometimes-pool test. Author

N86-14408# Osaka Univ. (Japan). Course of Electromagnetic Energy Engineering.
TWO DIMENSIONAL ANALYSIS OF ROD-TYPE LASER AMPLIFIER: SIMULATION CODE DEVELOPMENT **c36**
Tadash Yamada, Tadashi Kanabe, Masahiro Nakatsuka, Yoshiaki

Kato, and Chiyoe Yamanaka *In its* Technology Reports of the Osaka University, Vol. 35, Nos. 1800-1818 Oct. 1985 p 213-220 refs (For primary document see N86-14405 05-31)
Avail: NTIS HC A09/MF A01

The simulation code development for modeling the gain distribution of the rod type laser amplifier in the laser fusion system is reported. The calculation procedure of the gain distribution includes the physical processes such as the ray-trace of the pumping light in a pump cavity, the emission spectrum of the Xenon flash lamp with the time history dependent upon the discharge circuit condition, the absorption spectrum of the laser glass and the generation of the population inversion with the rate equation. It is found that the results of simulation is influenced considerably by the absorption process of the pumping light by the laser glass. The simulation code predicts the spatial gain distribution and the time development with a good agreement to the experimental data taking into account the fine spectral characteristic of the emission from a flash lamp and of the absorption of the laser glass. Author

N86-14409# Osaka Univ. (Japan). Dept. of Electronics Engineering.
TUNNELING SPECTROSCOPY OF InAs- AND CdSnAs2 -OXIDE-Pb JUNCTIONS IN STRONG MAGNETIC FIELD c76
Yuichi Nakashima and Chihiro Hamaguchi *In its* Technology Reports of the Osaka University, Vol. 35, Nos. 1800-1818 Oct. 1985 p 221-230 refs (For primary document see N86-14405 05-31)
Avail: NTIS HC A09/MF A01

A method has been proposed for analyzing tunneling spectra from junctions containing electronic subbands in strong magnetic fields. It is based on the effective mass and WKB approximations and the triangular surface-potential model, of which the parameters depend linearly on the applied bias voltage. The method is adapted to experimental results to study Landau splitting of the electronic subband and the pinning effect in InAs, and a good agreement is obtained. The method permits an estimation of the parameters of the accumulation layer in CdSnAs2 junction in spite of the absence of data on the pinning effect. The obtained surface potentials and electric fields are E sub d=(170.5 + or - 0.5 E sub f) + (353 + or - 3) x 10 to the -5 power F sub s (mV), F sub s = 10 to the 5th power x ((0.725 + or - 0.006) + (2.1 + or - 0.3)V) (V/cm) for the InAs junction, E sub d (286-E sub F + 431 x 10 to the -5th power F sub s (mV), F sub s = 10 to the 5th power x (0.085 + 1.02V) (V/cm) for the CdSnAs2 junction, where V is the bias in volts, and E sub F is the Fermi energy. Author

N86-14410# Osaka Univ. (Japan). Dept. of Electrical Engineering.
MECHANICAL AND ELECTRICAL PROPERTIES OF ELECTROCHEMICALLY PREPARED CONDUCTING POLYMERS c27
Katsumi Yoshino, Munchiro Tabata, Masaharu Satoh, Keiichi Kaneto, and Toshiyuki Ohsawa *In its* Technology Reports of the Osaka University, Vol. 35, Nos. 1800-1818 Oct. 1985 p 231-236 refs (For primary document see N86-14405 05-31)
Avail: NTIS HC A09/MF A01

Mechanical and electrical properties of various conducting polymers, such as electrochemically synthesized polypyrrole, polythiophene and polyselenophene are studied. It is found that the mechanical properties are strongly influenced by the molecular structures and doping levels. That is, the doped polypyrrole film indicates high mechanical strength, but its strength decreases remarkably after undoping. However, in the case of polythiophene film, remarkable differences of mechanical properties in both doped and undoped states are not observed. The relation between conditions of polymerization and mechanical strength in polypyrrole is discussed in comparison with electrical properties. Author

N86-14411# Osaka Univ. (Japan). Dept. of Electrical Engineering.
PHOTOCONDUCTIVITY EFFECT IN MODULATION-DOPED Al(0.3)Ga(0.7) As-GaAs MULTIPLE-QUANTUM-WELL STRUCTURES PREPARED BY MBE c76
Nobutomo Isshiki, Masahiro Tonomura, Junji Shirifuji, Naokatsu Sano (Kwansei Gakuin Univ.), Hiroshi Katoh (Kwansei Gakuin Univ.), Masaaki Nakayama (Kwansei Gakuin Univ.), and Yasutaka Watanabe (Kwansei Gakuin Univ.) *In its* Technology Report of the Osaka University, Vol. 35, Nos. 1800-1818 Oct. 1985 p 237-243 refs (For primary document see N86-14405 05-31)
Avail: NTIS HC A09/MF A01

Selectively-doped Al0.3Ga0.7As-GaAs heterostructures grown by MBE show persistent (PPC) and transient (TPC) photoconductivity effects at low temperatures below 100 K. These anomalous photoconductivity effects are efficiently induced by excitation at the fundamental edge of GaAs. The transient photoconductivity has a highly non-exponential character over a wide time range. For simplicity, the decay transient is discussed by deviding into fast and slow components. The fast decay component shows a remarkable change at about 20K, while the slow component depends little on ambient temperature below 77K. These two decay components of the transient photoconductivity are tentatively discussed in terms of thermally-activated and tunnel-assisted recombination processes. Author

N86-14412# Osaka Univ. (Japan). Course of Electromagnetic Energy Engineering.
PARAMETRIC STUDY ON OPTICALLY-PUMPED 385-MICRONS D2O LASER SYSTEM FOR PLASMA DIAGNOSTICS c36
Yo Ichikawa, Ludong Wu, Yoshiaki Tsunawaki (Osaka Industrial Univ.), Masanobu Yamanaka, Shigeaki Okajima (Chubu Univ.), Toshikatsu Iwasaki (Osaka Electro Communication Univ.), Tatsuhiko Yamanaka, and Chiyoe Yamanaka *In its* Technology Reports of the Osaka University, Vol. 35, Nos. 1800-1818 Oct. 1985 p 245-253 refs (For primary document see N86-14405 05-31)
Avail: NTIS HC A09/MF A01

An optically-pumped 385-micrometers D2O laser system has been constructed for the Thomson scattering ion temperature measurement in tokamak plasma. The output power of 120kW at 385 micrometers is obtained. The tunability over + or - 1GHz and the single transverse and longitudinal mode operation are performed on the pump TEA CO2 laser with an intracavity ZnSe etalon. Author

N86-14413# Osaka Univ. (Japan). Course of Electromagnetic Energy Engineering.
PULSED POWER COMPRESSION BY PLASMA OPENING SWITCH c75
Noboru Yugami, Shuji Miyamoto, Hirokazu Fujita, Tetsu Ozaki, Tatsuro Akiba, Kazuo Imasaki, Sadao Nakai, and Chiyoe Yamanaka *In its* Technology Reports of the Osaka University, Vol. 35, Nos. 1800-1818 Oct. 1985 p 255-260 refs (For primary document see N86-14405 05-31)
Avail: NTIS HC A09/MF A01

Inductive-energy-storage pulsed experiments using plasma opening switches have been carried out on a pulsed power generator (REIDEN IV-H). The plasma opening switch is an opening switch which operates on a nanosecond timescale. The experimental data show that the impedance of the switch increased up to 200 omega, a high voltage (6.4MV) and short pulse width (10nsec) output are obtained. The comparison between experimental data and analytic calculations indicates that the faster opening of the switch operation is obtained by increasing the plasma injection velocity and the self magnetic pressure effect mainly affects the final stage of the switch operation. Author

N86-14414# Osaka Univ. (Japan). Dept. of Precision Engineering.
LDVS USING POLARIZATION-PRESERVING OPTICAL FIBERS FOR SIMULTANEOUS MEASUREMENT OF MULTIDIMENSIONAL VELOCITY COMPONENTS c35
Noboru Nakatani, Muneo Tokita, Takao Izumi, and Tomoharu Yamada *In its* Technology Reports of the Osaka University, Vol. 35, Nos. 1800-1818 Oct. 1985 p 261-268 refs (For primary document see N86-14405 05-31)
Avail: NTIS HC A09/MF A01

LDV systems using polarization-preserving optical fibers are

developed by the polarization and the color methods for simultaneous measurement of multidimensional velocity components. It is shown that using optical fibers the optical systems are easily constructed, the more flexible systems are obtained and remote measurements are realized. A signal processors for the LDVs is developed using only a single frequency counter, a high-speed electronic scanner and a computer. Using Karman vortex flow and turbulent premixed flame, it is demonstrated that these systems are powerful tools for fluid mechanic measurements. Author

N86-14415# Osaka Univ. (Japan). Dept. of Architectural Engineering.

NUMERICAL ANALYSIS OF STEEL FRAME STRUCTURES SUBJECTED TO THERMAL GRADIENTS c39

Sadayoshi Igarashi and Kosal Cheat Eng (Shimizu Construction Co. Ltd.) *In its* Technology Reports of the Osaka University, Vol. 35, Nos. 1800-1818 Oct. 1985 p 269-278 refs (For primary document see N86-14405 05-31)

Avail: NTIS HC A09/MF A01

Methods applicable to the analysis of steel frame structures subjected to thermal gradients are presented. This method has been used to replace the costly and time-consuming standard fire tests. This analysis includes study of (1) the influence of the configuration of frame structures, (2) the change in material properties of steel at elevated temperatures (such as yield strength, the coefficient of thermal expansion and the modulus of elasticity), (3) the magnitude and the location of the applied loads and, finally, the temperature distribution of steel structures. The behavior of steel frame structures subjected to thermal gradients is studied numerically. Author

N86-14416# Osaka Univ. (Japan). Dept. of Environmental Engineering.

NUMERICAL COMPARISON BETWEEN THERMAL LOAD OF WARM AIR HEATING SYSTEM AND RADIANT HEATING SYSTEM. 1: OCCURRENCE OF CRITICAL CONVECTIVE HEAT TRANSFER COEFFICIENT c34

Kazuo Naito, Minoru Mizuno, and S. Mahmoud Ghaemmaghami *In its* Technology Reports of the Osaka University, Vol. 35, Nos. 1800-1818 Oct. 1985 p 299-308 refs (For primary document see N86-14405 05-31)

Avail: NTIS HC A09/MF A01

A numerical study has been performed for comparison of the thermal load of a single room when heated separately by a warm air heating system and by a radiant heating system. In general, when comparison of the thermal load for the aforementioned two heating systems - applied for the same room - is done using the condition of constant room temperature for both systems, the radiant heating system brings about more energy consumption than the conventional system. However, if the comparison of the thermal load is performed for the two cases using the condition that the same level of interior thermal environment is maintained for the two heating systems, the system with a better ability for energy savings would be in question. The conditions under which either of the two heating systems may be less energy consuming are discussed. In addition, the occurrence of a critical convective heat transfer coefficient will be shown and it also will be approximated as an index for grading the thermal load ratio of the heating system. Author

N86-14417# Osaka Univ. (Japan). Dept of Environmental Engineering.

CITIZEN PARTICIPATION IN THE 3-D URBAN DATA GENERATING PROCESS c85

Shin Yoshikawa and Tsuyoshi Sasadi *In its* Technology Reports of the Osaka University, Vol. 35, Nos. 1800-1818 Oct. 1985 p 323-330 refs (For primary document see N86-14405 05-31)

Avail: NTIS HC A09/MF A01

Citizen Participation in the planning of urban renewables has been a growing phenomenon. It is the important factor in citizen participation in planning that there are good mutual communications between local residents and planners. Citizen participation in the three-dimensional urban data generating process provides many opportunities to attain full communication among the persons concerned with the planning. This paper discusses the fundamental concepts of citizen participation in the 3-D urban data generating process, and proposes the 3-D urban data generator for non-specialists. An actual case study in the renewal area in Sanda City is presented to explain the techniques and the characteristics of the data generator. It is emphasized that actual operations have been done by the storekeepers in the area. Cityscape simulations also have been carried out using the data generated by the operations. Author

N86-14418# Yamaguchi Univ., Ube (Japan). Faculty of Engineering.

MEMOIRS OF THE FACULTY OF ENGINEERING, YAMAGUCHI UNIVERSITY, VOLUME 36, NO. 1

Oct. 1985 182 p refs In JAPANESE; ENGLISH summaries (ISSN-0372-7661) Avail: NTIS HC A09/MF A01

The results and conclusions of various undertakings in the fields of applied physics and engineering are presented. Topics covered range from modeling and control technology to manufacturing technology. For individual titles, see N86-14419 through N86-14430.

N86-14419# Yamaguchi Univ., Ube (Japan).

WEAR MECHANISM OF THE SI3N4 CERAMIC TOOLS IN CUTTING CAST IRON c37

Ryozo Kitagawa and Kitao Okusa *In its* Memoirs of the Faculty of Engineering, Yamaguchi University, Vol. 36, No. 1 Oct. 1985 p 1-7 refs In JAPANESE; ENGLISH summary (For primary document see N86-14418 05-31)

Avail: NTIS HC A09/MF A01

The silicon nitride ceramic Si3N4 is superior to the conventional oxide ceramic Al2O3 in several characteristics. It has greater shock resistance, the low rate of expansion at high temperature, and somewhat superior thermal conductivity. The Si3N4 ceramic tools used for this experiment were made by sintering method. Tool wear mechanism of Si3N4 ceramic tools in cutting has been studied with regard to ceramic grades and cutting edge failures. Ceramic tool's properties were varied by changing the chemical compositions and the sintering methods. Machining tests were conducted on a turning machine and a milling machine by cutting FC25 cast iron. Cutting speed was varied from 100 m/min to about 1000 m/min and feed rate was used at 0.2 or 0.3 mm/tooth whereas depth of cut was used constantly on these tests. After test runs, the following conclusions were obtained: (1) there is a great deal of influence in tool toughness, when the tools are intertwined with the rod type of the silicon nitride particles; and (2) it is found that the cutting ability of the tool relate with hardness and fracture toughness. This type of tools minimizes the fall off of the silicon nitride particles on the cutting edge and reduces wears on the flank face. Author

N86-14420# Yamaguchi Univ., Ube (Japan).

FUNDAMENTAL STUDY OF WAVE PHENOMENON IN THE EXHAUST PIPE OF AN INTERNAL COMBUSTION ENGINE c37

Haruo Izumi and Motokazu Fukuda *In its* Memoirs of the Faculty of Engineering, Yamaguchi University, Vol. 36, No. 1 Oct. 1985 p 9-16 refs In JAPANESE; ENGLISH summary (For primary document see N86-14418 05-31)

Avail: NTIS HC A09/MF A01

It is assumed that the back pressure of an engine increases due to the frictional resistance of the gas flow when the length of the exhaust pipe is increased. As matter of fact, however, the values of the back pressure increase or decrease according to the increase of the pipe length. The cause of the change of the back pressure resulting from the length of the exhaust pipe is presumed to be a wave interference. However, it is very difficult to pinpoint the wave phenomenon in an actual firing engine. Therefore, an air model engine is used in the experiment so that the observation of only one arbitrary time is possible. The piston is devised so that it can be fixed at an arbitrary position and the cylinder volume is kept constant. Compressed air is introduced

into the cylinder from the top of the cylinder head, and the exhaust valve is processed so that the valve opening time and the valve clearance can be changed from outside of the engine. By using this model engine, many interesting conclusions on the wave phenomenon are shown in this paper. Author

N86-14421# Yamaguchi Univ., Ube (Japan).
ELASTO-PLASTIC STRESS ANALYSIS BY BOUNDARY ELEMENT METHOD **c39**
Ken Kaminishi, Shun-ichi Kawano, and Shigetoshi Shimizu *In its* Memoirs of the Faculty of Engineering, Yamaguchi University, Vol. 36, No. 1 Oct. 1985 p 17-24 refs In JAPANESE; ENGLISH summary (For primary document see N86-14418 05-31)
Avail: NTIS HC A09/MF A01

The finite element method (FEM) is one of the most important and useful methods of the numerical analyses in the all fields of the engineering problems as well as structural analyses by using the large capacity of computers. On the other hand, integral equation technique have been considered to be a different type of analytical method through the works of Russian authors, such as Muskhelishvili, Miklim, et al. The work at the Southampton University group culminated in the first book in 1978 for which the title Boundary element Method (BEM) was used. BEM was demonstrated in linear elastic problems by Brebbia and more recently the work of BEM was extended to elasto-plastic problems. However, the accuracy of BEM calculation for elasto-plastic problems has not yet been clarified perfectly. The formulation of elasto-plastic boundary element analysis by divergence's theorem is presented. The issue of accuracy of the solutions calculated by the BEM programs was discussed for uni-axial tension and contact problems in the range of elastic and elasto-plastic problems, respectively. Author

N86-14422# Yamaguchi Univ., Ube (Japan).
THE PROPERTIES OF A ROW OF TRAILING VORTICES GENERATED IN THE UNIFORM FLOW. THE PATH OF TRAILING VORTEX **c02**
Hideo Osaka, Toshiaki Yamaguchi, and Yoshiro Kageyama *In its* Memoirs of the Faculty of Engineering, Yamaguchi University, Vol. 36, No. 1 Oct. 1985 p 25-29 refs In JAPANESE; ENGLISH summary (For primary document see N86-14418 05-31)
(Rept-1) Avail: NTIS HC A09/MF A01

Measurements of trailing vortices shedding from a row of wing placed in the uniform flow were made to investigate the properties of those. The wing used has a span of 30 mm and a chord of 20 mm and has a rectangular planform. Velocity profiles were measured at several attack angles and spanwise distance between the wings. In all cases the trailing vortices can be formed behind a row of wing and the spanwise variation of the U-component of mean velocity is produced by those vortices. The path of trailing vortex directs downwards with increasing the attack angle, while its path has a different tendency due to the spanwise distance between the wings. Author

N86-14423# Yamaguchi Univ., Ube (Japan).
THE PROPERTIES OF A ROW OF TRAILING VORTICES GENERATED IN THE UNIFORM FLOW. SHAPE OF TRAILING VORTEX AND ITS STREAMWISE VARIATION **c02**
Hideo Osaka, Toshiaki Yamaguchi, and Yoshiro Kageyama *In its* Memoirs of the Faculty of Engineering, Yamaguchi University, Vol. 36, No. 1 Oct. 1985 p 31-36 refs In JAPANESE; ENGLISH summary (For primary document see N86-14418 05-31)
(Rept-2) Avail: NTIS HC A09/MF A01

The measurements of trailing vortices behind a row of wing were made to examine mainly the shape and strength of those. Results show that the V- and W-component of mean velocity is produced by the trailing vortex, and that the secondary currents generated by those vortices direct downwards at the mid-span of wings, while upwards at the middle between the wings. The vortex wandering phenomenon is observed by the secondary flow vectors. The strength of trailing vortex increases with the attack angle. Author

N86-14424# Yamaguchi Univ., Ube (Japan).
MEASUREMENT OF GRANULAR SURFACE PATTERN IN A HOPPER BY ULTRASONIC WAVE SENSOR **c71**
Eiji Morimoto and Nobuo Hayano *In its* Memoirs of the Faculty of Engineering, Yamaguchi University, Vol. 36, No. 1 Oct. 1985 p 37-43 refs In JAPANESE; ENGLISH summary (For primary document see N86-14418 05-31)
Avail: NTIS HC A09/MF A01

Fundamental characteristics for pattern recognition of granular surface in a hopper by ultrasonic wave sensor was investigated experimentally for the purpose of developing the detector as a control unit. Results showed rize time of output voltage from the receiver affected directly the accuracy of measurement. Directivities of the sensing units have been improved by installing the conical shaped horns in front of both the transmitter and receiver. Experiments on the effect of the pulse wave length on the strength of its reflection from object indicated that duration time more than 300 microseconds was sufficient to reach the threshold level. Measurement error which was due to the irregular reflection from the particle surface and inner wall surface was reduced by arranging the four receivers around the emitter. Author

N86-14425# Yamaguchi Univ., Ube (Japan).
VISUAL OBSERVATION OF AN AXISYMMETRIC IMPINGING JET **c34**
Junji Kurima, George Miyaka, Hiroaki Sera, and Masahide Miyamoto *In its* Memoirs of the Faculty of Engineering, Yamaguchi University, Vol. 36, No. 1 Oct. 1985 p 45-49 refs In JAPANESE; ENGLISH summary (For primary document see N86-14418 05-31)
Avail: NTIS HC A09/MF A01

The behavior of flow structure of an axisymmetric impinging jet has been experimentally studied by using the flow-visualization techniques, i.e., the hydrogen bubble technique and the fluorescent dye injection. The Reynolds number based on the nozzle diameter ($D = 40$ mm) and the nozzle exit velocity is varied in the range of $4000 < Re < 11000$. The growth of vortex-like structures visualized by the hydrogen-bubble and the dye injection is observed either from the jet axis direction or in the jet cross section. When the jet impinges on the plate, the flow structure is varied by the relation between the location of the plate and the rolling up vortex. When the nozzle-to-plate spacing is less than the nozzle diameter, the frequency of occurance of ring vortices is remarkably effected by the impingement plate. With increasing nozzle-to-plate spacing, the frequency of transport of ring vortices decreases due to the coalescence of vortices and the turbulence in the boundary layer increases. Author

N86-14426# Yamaguchi Univ., Ube (Japan).
AN EXPERIMENTAL INVESTIGATION OF FREE CONVECTION COOLING OF ELECTRONIC EQUIPMENT **c33**
Masahide Miyamoto, Yasuo Katoh, and Masaichi Sakata *In its* Memoirs of the Faculty of Engineering, Yamaguchi University, Vol. 36, No. 1 Oct. 1985 p 51-59 refs In JAPANESE; ENGLISH summary (For primary document see N86-14418 05-31)
(Rept-3) Avail: NTIS HC A09/MF A01

An experimental study of free convection cooling of electronic components on PWB, which was placed horizontally in the cabinets, was carried out using the following two types of model cabinet: (1) the cabinets (200 x 150 mm in cross section, 80 mm high), which were made of acrylic resins plates (4 mm thick), had the ventilating small holes in the top panel and the bottom panel of them; and (2) the two-dimensional models of the cabinet (160 x 380 mm in cross section and 80 mm high) had many slits in the top panel of them. Numerical values of velocity of the ventilation, which were estimated by the heat balance analysis using the measured temperature, agreed with the values directly measured by LDV. It was demonstrated that the flow rate of ventilation could be estimated using the obtained relation between the ventilating air velocity and the mean temperature excess on the inner wall surface of the cabinets. Author

N86-14427# Yamaguchi Univ., Ube (Japan).
A NUMERICAL STUDY OF FREE CONVECTION COOLING OF

ELECTRONIC EQUIPMENT c33
Masahide Miyamoto, Yasuo Katoh, and Masaichi Sakata *In its* Memoirs of the Faculty of Engineering, Yamaguchi University, Vol. 36, No. 1 Oct. 1985 p 61-68 refs In JAPANESE; ENGLISH summary (For primary document see N86-14418 05-31)
(Rept-4) Avail: NTIS HC A09/MF A01

A numerical analysis of free convection from electronic components on PWB placed horizontally in the cabinets is described. The effects of aspect ratio H/L (H is the height of cabinet, L is length of it), dimensionless heat conductance of cabinet walls and baffle plate located at open side of cabinets on the free convection heat transfer in the cabinets were numerically investigated using finite difference method. It was clarified that the overall heat transfer coefficient was about 20% lower than that of an upward facing heated plate placed horizontally in semi-infinite space, and the streamline patterns obtained by present numerical analysis were in good agreement with the flow patterns visualized in the previous experiments. Author

N86-14428# Yamaguchi Univ., Ube (Japan).
RUPTURE PROPAGATION ANALYSES BY THE THREE DIMENSIONAL FINITE ELEMENT METHOD WITH JOINT ELEMENT c39
Fusanori Miura, Yoshihiro Okashige, and Hiroshi Okinaka *In its* Memoirs of the Faculty of Engineering, Yamaguchi University, Vol. 36, No. 1 Oct. 1985 p 81-87 refs In JAPANESE; ENGLISH summary (For primary document see N86-14418 05-31)
Avail: NTIS HC A09/MF A01

Spontaneous rupture propagation of the discontinuous plane which is modeled by the arrangement of three dimensional joint elements was simulated. To achieve this purpose, the joint element proposed by Toki, et al., was modified as follows. First, the assumption that four nodal points forming a joint plane were still on one plane even after its deformation was removed. Second, the stress drop was introduced in the shear component of the constitutive relationships of the element. Third, it was possible to model the discontinuous plane which had arbitrary normal direction by introducing a general three dimensional coordinate transform matrix. Two models were used in this study to verify the applicability of the modified element to express rupture propagation. One was used to examine the rupture propagation which propagated one-dimensionally, the other two-dimensionally. It was found that the modified joint element was able to express the rupture propagation phenomenon just same as the two dimensional joint element. Author

N86-14429# Yamaguchi Univ., Ube (Japan).
WALL EFFECTS ON THE PRODUCTION PROCESSES OF POSITIVE AND NEGATIVE IONS IN HYDROGEN PLASMAS c75
Seiji Isokane, Mitsugu Ueda, Osamu Fukumasa, and Setsuo Saeki *In its* Memoirs of the Faculty of Engineering, Yamaguchi University, Vol. 36, No. 1 Oct. 1985 p 105-115 refs In JAPANESE; ENGLISH summary (For primary document see N86-14418 05-31)
Avail: NTIS HC A09/MF A01

Positive and negative ion species ratios in hydrogen plasmas are calculated numerically as a function of plasma parameters by using the particle balance model. The model considers important processes for the production of both H- and positive ions. Particular attention has been paid to wall effects on volume production of H- ions. Therefore, the recombination coefficient gamma sub 1 for H and the de-excitation parameter gamma sub 2 for vibrationally excited molecules H2* at the wall surface are treated as numerical parameters. The calculated results have confirmed that H- ions are generated by dissociative attachment to highly excited H2* (vibrational level v' = 5-10) and these molecules are produced by fast electrons with energies in excess of 30 eV. The most significant point is that ion species ratios depend strongly not only on plasma parameters but also on wall parameters gamma sub 1 and gamma sub 2. With decreasing gamma sub 1, i.e., gamma sub 1 $<$ 1, H and H+ increase while H- ratio decreases because of the attenuation of H2* and the enhanced loss process, H- + H+ to 2H. Author

N86-14430# Yamaguchi Univ., Ube (Japan).
A MONITORING AND CONTROL SYSTEM FOR CUTTING TOOL'S DAMAGE BY ACOUSTIC EMISSION, PART 1 c37
Itsuo Takanami, Masuo Yoshioka, Yoshiro Sakai, and Kazumi Kobayashi *In its* Memoirs of the Faculty of Engineering, Yamaguchi University, Vol. 36, No. 1 Oct. 1985 p 117-123 refs In JAPANESE; ENGLISH summary (For primary document see N86-14418 05-31)
Avail: NTIS HC A09/MF A01

Some research on detecting cutting tool's damage have been done by using acoustic emission (AE) occurring on plastic deformation or destruction of tools. However, no good method was developed. Experimental results are presented as a foundation to construct a system which in real time detects damage of cutting tools and controls stopping of cutting machines. The system consists of an AE sensor unit and microcomputers for data processing and control. Thus, it is expected that the system may be constructed in relatively low cost. Author

N86-14431*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
QUALITATIVE PROPERTIES OF LARGE BUCKLED STATES OF SPHERICAL SHELLS Final Report
Ke-Gang Shih and Stuart S. Antman Sep. 1985 75 p refs Submitted for publication
(Contract NAS1-17070)
(NASA-CR-177980; ICASE-85-41; NAS 1.26:177980) Avail: NTIS HC A04/MF A01 CSCL 20K

A system of 6th-order quasi-linear Ordinary Differential Equations is analyzed to show the global existence of axisymmetrically buckled states. A surprising nodal property is obtained which shows that everywhere along a branch of solutions that bifurcates from a simple eigenvalue of the linearized equation, the number of simultaneously vanishing points of both shear resultant and circumferential bending moment resultant remains invariant, provided that a certain auxiliary condition is satisfied. Author

N86-14432# Air Force Engineering and Services Center, Tyndall AFB, Fla. Engineering and Services Lab.
FIRE ALARM SYSTEM/FIRE SUPPRESSION SYSTEM FOR MOBILE TACTICAL SHELTERS Final Report, Dec. 1983 - May 1985
F. K. Walker, C. A. LeCours, and O. Radcliff Aug. 1985 94 p
(AF Proj. 2505)
(AD-A158899; AFESC/ESL-TR-85-20) Avail: NTIS HC A05/MF A01 CSCL 13/12

The objective of this project was to develop a fire detection/suppression capability for DoD standard family mobile tactical shelters. The systems developed and tested provide complete protection during all employment conditions; in garrison use, storage, transportation, and deployed field conditions. The reports outlines the requirement and the test and evaluation program. Two manufacturers of detection systems and two manufacturers of suppression systems were identified and qualified to meet the fire protection requirements for mobile tactical shelters. GRA

N86-14433# Joint Publications Research Service, Arlington, Va.
CHINA REPORT: SCIENCE AND TECHNOLOGY
22 Aug. 1985 181 p refs Transl. into ENGLISH from various Chinese articles
(JPRS-CST-85-027) Avail: NTIS HC A09/MF A01

Current developments from the People's Republic of China in the area of science and technology are reported. Topics of discussion include: (1) national developments; (2) applied sciences; (3) life sciences; (4) environmental quality; and (50 scientists and scientific organizations. For individual titles, see N86-14434 through N86-14437.

N86-14434# Joint Publications Research Service, Arlington, Va.
LASER ACTIVE COLOR CENTERS STUDIES c36
You Lu, Li Ping, Li Shenghua, Fang Shugan, He Shaoqi, and Wang Kuihua *In its* China Report: Science and Technology (JPRS-CST-85-027) 22 Aug. 1985 p 90-98 refs Transl. into ENGLISH from Zhongguo Jiguang (Shanghai), v. 12, no. 1,

20 Jan. 1985 p 15-19 (For primary document see N86-14433 05-31)
Avail: NTIS HC A09/MF A01

By using an additive coloration method, an F-center concentration of 10 to the -16 to 10 to the -18 in KCl:Na crystals is obtained. The F sub B(II) centers are formed by exposing the additive colored crystal to the F-band excitation, and the emission band of the color centers covers the range of 2.1 to 2.8 micron with a peak at 2.5 micron. Author

N86-14435# Joint Publications Research Service, Arlington, Va.
THE 11 GHz STABLE GaAs-FET OSCILLATOR DESCRIBED c33
Xi Tianmin *In its* China Report: Science and Technology (JRPS-CST-85-027) 22 Aug. 1985 p 106-114 Transl. into ENGLISH from Dianzi Jishu Yingyong (Beijing), no. 1, 25 Jan. 1985 p 27-30 (For primary document see N86-14433 05-31)
Avail: NTIS HC A09/MF A01

A stabilized medium stable 11 GHz GaAs-FET oscillator is introduced. In the past, it was microwave bulk effect diodes or avalanche diodes that were used mostly as the active component in K wave segment low power solid state oscillators. However, because the bulk effect oscillators are low in power and the avalanche oscillators are noisy, it was felt that there were some inadequacies in using them as local oscillators in receivers. However, using a stabilized medium harmonic oscillator to stabilize the frequency basically satisfies the receiver demands on the local oscillator. However, limited to the performance and materials of medium harmonic oscillators and the performance of GaAs-FET which are currently produced in China, the electrical performance indicators for this oscillator are still not very ideal. G.L.C.

N86-14436# Joint Publications Research Service, Arlington, Va.
INR 30MeV SECTOR FOCUSED CYCLOTRON DETAILED c72
Chang Hongjun *In its* China Report: Science and Technology (JPRS-CST-85-027) 22 Aug. 1985 p 115-121 Transl. into ENGLISH from He Jishu (Shanghai), no. 2, Apr. 1985 p 12-21 (For primary document see N86-14433 05-31)
Avail: NTIS HC A09/MF A01

The original 1.2 m cyclotron at the Shanghai Institute of Nuclear Research was a classical fixed energy cyclotron and the performance parameters in 1964 when the cyclotron was built were: energy: 6.8 MeV for P, 13.6 MeV for D, and 27.2 MeV for alpha; energy spread, delta E/E = 1 to 1.5%; and outer beam 50 micro amp. To improve the performance of the cyclotron for nuclear physics research and nuclear technology experimentation, a modification proposal was drafted in 1978 to change the cyclotron into a sector focused variable energy cyclotron. After physical design, simulation experiments, technical design, and engineering preparation, the machine was shut down in the summer of 1982 and a beam was obtained in 1983 on schedule. After the modification, the energy constant becomes K = 40, protons may be accelerated to 30MeV and tunable in the 10-30MeV range. In addition, H2+ ions may be accelerated at triple frequency to obtain 2-2.5MeV and 6-9MeV protons. The energy may be changed in 2 hours. G.L.C.

N86-14437# Joint Publications Research Service, Arlington, Va.
STATUS OF FUDAN VAN DE GRAAF REVIEWED c70
Yuan Daosheng, Fei Zhiyu, Lu Changrong, Sun Chuanchen, Ye Kezhong, Wu Peichun, Jin Jiangqiu, and Gu Yuanzhuang *In its* China Report: Science and Technology (JPRS-CST-85-027) 22 Aug. 1985 p 122-127 refs Transl. into ENGLISH from He Jishu (Shanghai), no. 2, Apr. 1985 p 22-24 (For primary document see N86-14433 05-31)
Avail: NTIS HC A09/MF A01

The Accelerator Laboratory of Fudan University converted its 2.5 MV proton Van de Graaf to a 4 MV accelerator and the bulk of the conversion was completed in September 1979. Since then, a series of performance tests were made and the no-load voltage has reached 5 MV with the accelerator tube filled with 5 atmospheres of nitrogen gas. Because of accelerator tube problem, the particle energy failed to reach the 4 MeV target. Although a stable 3.2 MeV was once obtained during adjustment, the maximum energy available for experiments was only 2.85 MeV. The operation of the accelerator in the years since 1981 is described. G.L.C.

N86-14438# Joint Publications Research Service, Arlington, Va.
CHINA REPORT: SCIENCE AND TECHNOLOGY
30 Sep. 1985 118 p refs Transl. into ENGLISH from various Chinese articles
(JPRS-CST-85-033) Avail: NTIS HC A06/MF A01

Progress in science and technology is highlighted in this China report. Topics discussed include: National Development; Applied Sciences; and Scientists and Scientific organizations. Abstracts are presented of research in organic chemistry, physical chemistry, optics and computer applications. For individual titles, see N86-14439 through N86-14442.

N86-14439# Joint Publications Research Service, Arlington, Va.
CHINA'S FIRST CONTROLLED THERMONUCLEAR FUSION EXPERIMENT DETAILED c75
Zhiyao Zhu and Youquan Hu *In its* China Report: Science and Technology (JPRS-CST-85-033) 30 Sep. 1985 p 66-70 Transl. into ENGLISH from Kexue Shiyan (Beijing), no. 2, 10 Feb. 1985 p 2-4 (For primary document see N86-14438 05-31)
Avail: NTIS HC A06/MF A01

Controlled thermonuclear reaction has become one of the major topics of current scientific research. This paper details China's first controlled thermonuclear fusion experiments, China Cyclotron No. 1. Research and development activities undertaken in support of this industrial tokamak facility are highlighted. B.W.

N86-14440# Joint Publications Research Service, Arlington, Va.
COMPUTER-AIDED DESIGN OF CAMS c61
Fengchi Zhang *In its* China Report: Science and Technology (JPRS-CST-85-033) 30 Sep. 1985 p 71-76 Transl. into ENGLISH from Dianzi Jishu Yingyong (Beijing), no. 12, 25 Dec. 1984 p 5-7 (For primary document see N86-14438 05-31)
Avail: NTIS HC A06/MF A01

A cam is a mechanism which is widely used in automated machines, instruments, and various control devices; by properly designing the profile of the cam, it is possible to achieve any desired motion of moving parts. Therefore, the central problem of cam design is to determine the profile of the cam in accordance with the desired motion of a particular moving part. Cam design can be carried out by either graphical or analytical method. Graphical method provides a simple means of plotting the profile, but because of the large plotting errors involved, it cannot meet the requirement of high-precision cams. For such applications it is necessary to use analytical method to derive the equation of the cam profile, from which the coordinates of each point on the profile can be accurately calculated and plotted. With the development of computer technology and increasing use of digital control technology and photo-electric technology in machine processing, analytical method of cam design now has more practical value and is expected to be widely used in actual production. A BASIC program CP-1 was developed to design the profiles of disk cams with reciprocating type followers. The details of this program are discussed. B.W.

N86-14441# Joint Publications Research Service, Arlington, Va.
DUAL-FREQUENCY LASER ENERGY CENTER TEST INSTRUMENTS c36
Caiting Fu, Linbao Tang, and Dingyu Fei *In its* China Report: Science and Technology (JPRS-CST-85-033) 30 Sep. 1985 p 77-89 ref Transl. into ENGLISH from Dianzi Jishu Yingyong (Beijing), no. 12, 25 Dec. 1984 p 12, 13-17 (For primary document see N86-14438 05-31)
Avail: NTIS HC A06/MF A01

Laser provides a new dimension to high-precision level measurement because of its good monochromaticity, high energy concentration, and narrow beam. But a laser propagating through the atmosphere is subject to the following two adverse effects: one is the effect of absorption and scattering of the light wave by the atmosphere, resulting in the attenuation of laser energy, it is called atmospheric attenuation; the second effect is the atmo-

spheric turbulence which causes random fluctuations in the index of refraction. In order to overcome this difficulty, theoretical research and practical development of a dual-frequency laser system are being pursued both in China and abroad. A dual-frequency laser is a device which emits laser beams with two different wavelengths; it provides a means for eliminating and correcting the measurement errors caused by atmospheric turbulence. The basic principle of a dual-frequency measurement system is briefly described, and the designs of two practical measurement systems are discussed. In particular, the operation and circuit design of a dual-frequency laser energy-center test instrument developed by the authors is described in detail. B.W.

N86-14442# Joint Publications Research Service, Arlington, Va.
LINEAR EXPANSION OF POLYURETHANE FOAM AT LOW TEMPERATURE **c27**
Xian Zhu, Yongfu Ji, Jianke Zhang, Pingxian Bai, and Yuanzhou Han *In its* China Report: Science and Technolgy (JPRS-CST-85-033) 30 Sep. 1985 p 90-97 refs Transl. into ENGLISH from Yuhang Xuebao (Beijing), no. 4, 31 Oct. 1984 p 98-103 (For primary document see N86-14438 05-31)
Avail: NTIS HC A06/MF A01

The effects of linear expansion of polyurethane foam on thermal insulation at low temperatures have been analyzed. The laws of linear expansion of polyuresthane foam at low temperature varying with temperature, density, directions and times of heat cycle have been studied and determined, and their mechanisms has been researched. Based on a lot of experiments, the change range and average value of the linear expansion of polyurethane at low temperatures have been given. Author

N86-14443# Joint Publications Research Service, Arlington, Va.
CHINA REPORT: SCIENCE AND TECHNOLOGY
23 Oct. 1985 127 p refs Transl. into ENGLISH from various Chinese articles
(JPRS-CST-85-036) Avail: NTIS HC A07/MF A01

Various topics related to science and technology in China are discussed. Nylon, swept forward wing, neodymium lasers, molecular turbine pumps, and biochemistry are among the topics covered. For individual titles, see N86-14444 through N86-14449.

N86-14444# Joint Publications Research Service, Arlington, Va.
STRUCTURE OF NYLON 1010 DESCRIBED **c27**
Xiaozhen Yang, Shiru Hu, Yafei Lu, Shannong Zhu, and Xiangkui Li *In its* China Report: Science and Technology (JPRS-CST-85-036) 23 Oct. 1985 p 19-26 refs Transl. into ENGLISH from Gaofenzi Tongxun (Beijing), no. 3, Jun. 1985 p 202-206 (For primary document see N86-14443 05-31)
Avail: NTIS HC A07/MF A01

Nylon 1010 specimens prepared from both vitreous and melted crystalline states were studied by X-ray diffraction, infrared spectroscopy, differential scanning calorimetry, polarized optical microscopy, viscoelasticity and density. It was found that its structure is similar to that of Nylon 66. However, the lattice is greatly distorted when crystallized from the melt. Related problems were discussed and a hydrogen bond plane distortion model was introduced. Author

N86-14445# Joint Publications Research Service, Arlington, Va.
DIFFERENTIAL ELASTIC SCATTERING CROSS SECTIONS OF 14.2 MeV NEUTRONS FROM NIOBIUM **c72**
Jingde Li, Daquan Xie, Yexiang Li, Di Zhang, Shiming Wang, and Jianhua Cao *In its* China Report: Science and Technology (JPRS-CST-85-036) 23 Oct. 1985 p 27-34 refs Transl. into ENGLISH from Yuanzihe Wuli (Beijing), v. 7, no. 2, May 1985 p 106-111 (For primary document see N86-14443 05-31)
Avail: NTIS HC A07/MF A01

Elastic scattering is the primary physical process in the interaction between fast neutrons and matter. Accurate data of differential elastic scattering cross sections is not only valuable in the design of nuclear reactors and in other nuclear projects, but also provides a reliable basis for adjusting optical model parameters, verifying theoretical models, and predicting measured data in energy deficient zones. The superior physical properties of niobium makes it an attractive construction material for reactors. In fusion reactors, there is growing interest in using niobium as the cover layer for the fusion plasma; consequently, the kind of niobium neutron data presented here is becoming increasingly more important. R.J.F.

N86-14446# Joint Publications Research Service, Arlington, Va.
DIFFERENTIAL CIRCUIT MODEL FOR TURBOMOLECULAR PUMP BLADE **c37**
Jiguo Chu and Yunlong Sun *In its* China Report: Science and Technology (JPRS-CST-85-036) 23 Oct. 1985 p 35-48 refs Transl. into ENGLISH from Zhenkong Kexue yu Jishu (Beijing), v. 4, no. 5, Sep. 1984 p 311-318, 334 (For primary document see N86-14443 05-31)
Avail: NTIS HC A07/MF A01

Based on a differential circuit model for turbomolecular pump blades, the simple relation of its compression ratio versus the leak gap and impeller spacing was obtained. In addition, a comprehensive correction method for compression ratio was introduced. Calculated results agreed with experimental data well. Furthermore, the relation between compression ratio and impeller spacing is not as close as predicted by the molecular drag theory. Author

N86-14447# Joint Publications Research Service, Arlington, Va.
THEORETICAL CALCULATION OF PULSED ACTIVE-PASSIVE MODE-LOCKED SOLID STATE LASERS, PART 1 **c36**
Zhenghe Zhu *In its* China Report: Science and Technology (JPRS-CST-85-036) 23 Oct. 1985 p 49-58 refs Transl. into ENGLISH from Wuli Xuebao (Beijing), v. 34, no. 5, May 1985 p 603-610 (For primary document see N86-14443 05-31)
Avail: NTIS HC A07/MF A01

A theoretical model for pulsed active-passive mode-locked solid state lasers is presented. The characteristics of these lasers can be solved by computer simulation with this model. Author

N86-14448# Joint Publications Research Service, Arlington, Va.
THEORETICAL CALCULATION OF PULSED ACTIVE-PASSIVE MODE-LOCKED SOLID STATE LASERS, PART 2 **c36**
In its China Report: Science and Technology (JPRS-CST-85-036) 23 Oct. 1985 p 59-71 refs Transl. into ENGLISH from Wuli Xuebao (Beijing), v. 34, no. 5, May 1985 p 610-621 (For primary document see N86-14443 05-31)
Avail: NTIS HC A07/MF A01

Computer simulations are carried out using a theoretical model for pulsed active-passive mode-locked Nd-glass and Nd:YAG lasers. The dependences of some characteristics of active-passive mode-locked lasers, such as mode-locking threshold, output stability, pulse width, and pulse asymmetry, on the modulation depth and detuning of the active modulator and the relaxation time and concentration of the relaxation time and concentration of the saturable dye are obtained in the simulations. The theoretical results are in good qualitative agreement with the experiments. The simulations explained some of the experimental observations and provided further understanding of the physical processes involved in active-passive mode-locking. Author

N86-14449# Joint Publications Research Service, Arlington, Va.
CONFIGURATION AND LONGITUDINAL WIND TUNNEL TESTING]HY] OF FORWARD-SWEPT WINGS **c09**
Weiliang Ye and Renxi Xiao *In its* China Report: Science and Technology (JPRS-CST-85-036) 23 Oct. 1985 p 80-90 refs Transl. into ENGLISH from Kongqidonglixue Xuebao (Mianyang, China), no. 2, Jun. 1985 p 61-68 (For primary document see N86-14443 05-31)
Avail: NTIS HC A07/MF A01

Based on low-speed wind tunnel testing, calculation of load distribution and the transonic-supersonic area rule, the aerodynamic characteristics of aircraft with a configuration of forward-swept wings (FSW) are analyzed. Measures for improving the aerodynamic characteristics of FSW are suggested. The principle of symmetry is used to solve problems related to the application of the area

eddy method and the area rule calculation method for FSW. The experimental research and calculations show that FSW have rather good aerodynamic characteristics and that a winglet at the wing tip can improve the lift and lift-drag ratios FSW. FSW more closely approximate an optimum load distribution than do aft-swept wings (ASW). There are obvious improvements in airflow separation at the FSW base from using a close-coupled canard and a fairing panel at the wing base. FSW more closely approximate an optimum load distribution than do ASW. The axial cross-sectional load distribution on an FSW with a canard more easily approximates an optimum load distribution and thereby can result in an obvious reduction in zero-lift wave drag. Author

N86-14450# Joint Publications Research Service, Arlington, Va.
EAST EUROPE REPORT: SCIENCE AND TECHNOLOGY
28 Oct. 1985 91 p Transl. into ENGLISH from various East European articles
(JPRS-ESA-85-032) Avail: NTIS HC A05/MF A01

This east Europe report highlights recent advances in science and technology. Countries represented in this document include: Albania, Bulgaria, Czechoslovakia, Germay, Democratic Republic, Hungary, and Poland. Topics of interest include: computer engineering; computer-aided manufacturing; computer networks; and advances in anticorrosion coatings. Areas of international cooperation are also highlighted. For individual titles, see N86-14451 through N86-14453.

N86-14451# Joint Publications Research Service, Arlington, Va.
PRESENT, PROSPECTS OF COMPUTER CONTROLLED MANUFACTURING CELLS **c37**
Jozsef Hatvany, Matyas Horvath, and Janos Somlo *In its* East Europe Report: Science and Technology (JPRS-ESA-85-032) 28 Oct. 1985 p 48-57 Transl. into ENGLISH from Magyar Elektronika (Budapest), no. 1, 1985 p 42-47 (For primary document see N86-14450 05-31)
Avail: NTIS HC A05/MF A01

The most comprehensive trend in the development of machine manufacturing technology is flexible automation. Of more recent origin is the spread of automation to designing, process control and quality control, the distribution of the ever increasing intelligence of the systems among system components, and system structure based on manufacturing cells. The manufacturing cells are being integrated into automated shops, and even automated factories are in operation. The highest level of intelligence is represented by a cell with high level planning, learning, structural optimizing and self-organizing ability. The intelligence can be distributed in various ways between cell control and the control units of the equipment. There is no doubt, however, that the third and fourth levels presume the use of machine intelligence, expert and reasoning system and a higher level knowledge base (involving active and meta-awareness) going beyond facts and data. The development of a cell satisfying the requirements of the third intelligence level is discussed. The first applications are for this cell is the manufacture of cabinet type, mass workpieces. B.W.

N86-14452# Joint Publications Research Service, Arlington, Va.
SOVIET COOPERATION IN COMPUTER NETWORKS TELEDATA PROCESSING **c62**
Geza Odor *In its* East Europe Report: Science and Technology (JPRS-ESA-85-032) 28 Oct. 1985 p 77-78 Transl. into ENGLISH from Muszaki Elet (Budapest), 17 Aug. 1985 p 3 (For primary document see N86-14450 05-31)
Avail: NTIS HC A05/MF A01

Leaders of the Hungarian OMFB (National Technical Development Committee) and MTA (Hungarian Academy of Sciences) and of the Scientific and Technical State Committee of the Soviet Union signed a science and technology cooperation agreement pertaining to the creation of computer networks and remote data processing systems and devices in Moscow. The agreement program includes work on the following themes: information computer networks, their architecture and supplying them with software; providing software for systems serving to model and design heterogeneous computer systems and for administrative functions; theory and applications connected with creation of databanks and computer networks; and an automated information exchange system and its experimental operation between the Hungarian People's Republic and the Soviet Union. B.W.

N86-14453# Joint Publications Research Service, Arlington, Va.
ADVANCES IN ANTICORROSIVE COATINGS, CASTING TECHNOLOGY **c26**
In its East Europe Report: Science and Technology (JPRS-ESA-85-032) 28 Oct. 1985 p 86-87 Transl. into ENGLISH from Rzeczpospolita (Warsaw), 7-8 Sept. 1985 p 4 (For primary document see N86-14450 05-31)
Avail: NTIS HC A05/MF A01

For many decades research institutes all over the world have been investigating so far with little success. The losses incurred by the economy due to corrosion, however, have been motivating scientists for continued research and development into new methods. A major result in research into aluminum coating is examined. A method combining the application of the aluminum coating with a thermal processing was developed. After the bath, the steel is subjected to a compression treatment. As a result, the adhesion of the protective coating is improved, while the strength of the wire is 2.5 times greater than with the conventional process. A piece of equipment has also been constructed for testing the thermomechanical properties of polymers. It can also be used to measure the polymer creep or relaxation at a constant temperature. The equipment provides data on physical and chemical changes of polymers occurring at temperatures of 150-470 K. From the thermometric curves it is possible to read the temperatures of the phase transitions of the first and second kind and the maximum crystallization rate. B.W.

N86-14454# Joint Publications Research Service, Arlington, Va.
WEST EUROPE REPORT: SCIENCE AND TECHNOLOGY
4 Sep. 1985 66 p Transl. into ENGLISH from various West European articles
(JPRS-WST-85-026) Avail: NTIS HC A04/MF A01

Research progress in West European Science and technology is is reported. Topics discussed include: advanced materials, aerospace engineering, computer techniques, automation microelectronics, scientific and industrial policies, and technology transfer. For individual titles, see N86-14455 through N86-14456.

N86-14455# Joint Publications Research Service, Arlington, Va.
RTM OF ITALY APPLIES POWER LASERS TO WELDING, HARDENING **c36**
Andre Larane *In its* West Europe Report: Science and Technology (JPRS-WST-85-026) 4 Sep. 1985 p 12-15 Transl. into ENGLISH from Industries and Techniques (Paris), 20 Mar. 1985 p 35-37 (For primary document see N86-14454 05-31)
Avail: NTIS HC A04/MF A01

The Institute for Mechanical Technology Research and Automation (RTM) has five power lasers, including one with a 15-kW output all lasers are used for process development like, sheet metal welding and spot hardening feasibility tests of mechanical part machining and surface treatment are described. E.A.K.

N86-14456# Joint Publications Research Service, Arlington, Va.
FRG RESEARCH NETWORK TO INCREASE ACCESS TO COMPUTERS **c62**
Uli Deker *In its* West Europe Report: Science and Technology (JPRS-WST-85-026) 4 Sep. 1985 p 40-48 Transl. into ENGLISH from Bild der Wissenschaft (Stuttgart), Apr. 1985 p 76-94 (For primary document see N86-14454 05-31)
Avail: NTIS HC A04/MF A01

High-performance computers, special graphic output devices, automated experiment equipment, and complex program systems which had valuable potential, for scientific work are discussed. They can be used on site, and throughout the Federal Republic, by the end of 1988, the German Research Network is to be built and universities and research institutes connected on a widespread basis. The rough structure of datex-P-network is shown. The German Research Network is to be used to send programs, data

and messages to start programs on a supercomputer from one place and produce graphics, for which they use the design programs and the special output devices at another place. The application, policies and use of the supercomputer are outlined. E.A.K.

N86-14458*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
COUPLED TRANSLATIONS OF THE 64-METER ANTENNA SUBREFLECTOR SUPPORTS
M. S. Katow *In its* The Telecommunications and Data Acquisition Report 15 Nov. 1985 p 1-11 ref (For primary document see N86-14457 05-32)
Avail: NTIS HC A10/MF A01 CSCL 20K

N86-14459*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SEISMIC ANALYSIS OF THE LARGE 70-METER ANTENNA. PART 2: GENERAL DYNAMIC RESPONSE AND A SEISMIC SAFETY CHECK
K. Kiedron and C. T. Chian *In its* The Telecommunications and Data Acquisition Report 15 Nov. 1985 p 12-25 refs (For primary document see N86-14457 05-32)
Avail: NTIS HC A10/MF A01 CSCL 13I

N86-14866# Joint Publications Research Service, Arlington, Va.
VALIDATION OF RELIABILITY OF FIRE EXTINGUISHERS FOR MEDICAL PRESSURE CHAMBERS
G. Kh. Kharisov and N. F. Bubyr *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) 25 Nov. 1985 p 116-119 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 83-84 (For primary document see N86-14848 05-51)
Avail: NTIS HC A07

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N86-14457*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE TELECOMMUNICATIONS AND DATA ACQUISITION REPORT Progress Report, Jul. - Sep. 1985
E. C. Posner, ed. 15 Nov. 1985 221 p refs
(NASA-CR-176395; JPL-PR-42-83; NAS 1.26:176395) Avail: NTIS HC A10/MF A01 CSCL 17B

Developments in programs managed by the Jet Propulsion Laboratory's Office of Telecommunications and Data acquisition are discussed. Space communications, radio antennas, the Deep Space Network, antenna design, Project SETI, seismology, coding, very large scale integration, downlinking, and demodulation are among the topics covered. For individual titles, see N86-14458 through N86-14476.

N86-14458*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
COUPLED TRANSLATIONS OF THE 64-METER ANTENNA SUBREFLECTOR SUPPORTS **c31**
M. S. Katow *In its* The Telecommunications and Data Acquisition Report 15 Nov. 1985 p 1-11 ref (For primary document see N86-14457 05-32)
Avail: NTIS HC A10/MF A01 CSCL 20K

The Tricone subreflector assembly of the 64-m diameter antenna is supported from the apex of the quadripod by six flexure rods. The subreflector can be translated in the three orthogonal axes by jackscrews at the ends of each rod. The arrangement of the six rods is described and analysis of the position errors introduced by coupled translation is presented. The results indicate that negligible RF gain losses caused by axis-coupled translations (less than 0.05 dB) are possible at X-band (8.45 GHz) operation.
Author

N86-14459*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SEISMIC ANALYSIS OF THE LARGE 70-METER ANTENNA. PART 2: GENERAL DYNAMIC RESPONSE AND A SEISMIC SAFETY CHECK **c31**
K. Kiedron and C. T. Chian *In its* The Telecommunications and Data Acquisition Report 15 Nov. 1985 p 12-25 refs (For primary document see N86-14457 05-32)
Avail: NTIS HC A10/MF A01 CSCL 13I

An extensive dynamic analysis for the new JPL 70-meter antenna structure is presented. Analytical procedures are based on the normal mode decomposition which include dumping and special forcing functions. The dynamic response can be obtained for any arbitrarily selected point on the structure. A new computer program for computing the time-dependent, resultant structural displacement, summing the effects of all participating modes, was developed also. Program compatibility with natural frequency analysis output was verified. The program was applied to the JPL 70-meter antenna structure and the dynamic response for several specially selected points was computed. Seismic analysis of structures, a special application of the general dynamic analysis, is based also on the normal modal decomposition. Strength specification of the antenna, with respect to the earthquake excitation, is done by using the common response spectra. The results indicated basically a safe design under an assumed 5% or more damping coefficient. However, for the antenna located at Goldstone, with more active seismic environment, this study strongly recommends and experimental program that determines the true damping coefficient for a more reliable safety check.
Author

N86-14460*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
IN SEARCH OF A 2-dB CODING GAIN
J. H. Yuen and Q. D. Vo *In its* The Telecommunications and Data Acquisition Report 15 Nov. 1985 p 26-33 refs (For primary document see N86-14457 05-32)
Avail: NTIS HC A10/MF A01 CSCL 17B

A recent code search found a (15,1/5), a (14,1/6), and a (15,1/6) convolutional code which, when concatenated with a 10-bit (1023,959) Reed-Solomon (RS) code, achieves a bit-error rate (BER) of 0.000001 at a bit signal-to-noise ratio (SNR) of 0.50 dB, 0.47 dB and 0.42 B, respectively. All of these three codes outperform the Voyager communication system, our baseline, which achieves a BER of 10.000001 at bit SNR of 2.53 db, by more than 2 dB. The 2 dB coding improvement goal was exceeded.
Author

N86-14461*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DECODING CONVOLUTIONALLY ENCODED IMAGES
G. H. Pitt, III and L. Swanson *In its* The Telecommunications and Data Acquisition Report 15 Nov. 1985 p 34-38 ref (For primary document see N86-14457 05-32)
Avail: NTIS HC A10/MF A01 CSCL 17B

Maximum Likelihood Convolutional Decoding, which is used by the Deep Space Network for short constraint-length convolutional codes, assumes that all strings of information bits are equally likely. In some cases, like image data, this is not the case. The use of information about an adjacent pixel in decoding convolutionally encoded Voyager images is examined. It is discovered that, in a region of interest, as much as 2 dB may be gained. Author

N86-14462*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ERASURE INFORMATION FOR A REED-SOLOMON DECODER
G. H. Pitt, III and L. Swanson *In its* The Telecommunications and Data Acquisition Report 15 Nov. 1985 p 39-44 ref (For primary document see N86-14457 05-32)

Avail: NTIS HC A10/MF A01 CSCL 17B

Many Reed-Solomon decoders, including the one decoding the outer code for Voyager data from Uranus, assume that all symbols have the same chance of being correct or incorrect. Insome cases, like in a burst of incorrect symbols, this is not the case, and a Reed-Solomon decoder could make use of this. The use of information about bit quality sent to the Reed-Solomon from an (inner) Viterbi decoder is examined, as well as information about the error status of adjacent symbols in decoding interleaved Reed-Solomon encoded symbols. It is discovered that, in a region of interest, only about 0.04 dB can gained. Author

N86-14463*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

A VLSI SINGLE CHIP 8-BIT FINITE FIELD MULTIPLIER c33

I. S. Hsu, L. J. Deutsch, T. K. Truong, and H. M. Shao *In its* The Telecommunications and Data Acquisition Report 15 Nov. 1985 p 45-50 refs (For primary document see N86-14457 05-32)

Avail: NTIS HC A10/MF A01 CSCL 09A

A Very Large Scale Integration (VLSI) architecture and layout for an 8-bit finite field multiplier is described. The algorithm used in this design was developed by Massey and Omura. A normal basis representation of finite field elements is used to reduce the multiplication complexity. It is shown that a drastic improvement was achieved in this design. This multiplier will be used intensively in the implementation of an 8-bit Reed-Solomon decoder and in many other related projects. Author

N86-14464*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

A VLSI SINGLE CHIP (255,223) REED-SOLOMON ENCODER c33

I. S. Hsu, L. J. Deutsch, T. K. Truong, and I. S. Reed (Univ. of Southern California) *In its* The Telecommunications and Data Acquisition Report 15 Nov. 1985 p 51-56 refs (For primary document see N86-14457 05-32)

Avail: NTIS HC A10/MF A01 CSCL 09A

A description of a working single chip implementation of a Reed-Solomon encoder. The code used is the Consultative Committee on Space Data Systems (CCSDS) standard (255,223) code. The architecture that leads to this single very large scale integration chip design makes use of a bit-serial finite field multiplication algorithm of E. R. Berlekamp. Author

N86-14465*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

CARRIER TRACKING BY SMOOTHING FILTER CAN IMPROVE SYMBOL SNR c33

C. A. Pomalaza-Raez and W. J. Hurd *In its* The Telecommunications and Data Acquisition Report 15 Nov. 1985 p 57-62 refs (For primary document see N86-14457 05-32)

Avail: NTIS HC A10/MF A01 CSCL 09C

The potential benefit of using a smoothing filter to estimate carrier phase over use of phase locked loops (PLL) is determined. Numerical results are presented for the performance of three possible configurations of the deep space network advanced receiver. These are residual carrier PLL, sideband aided residual carrier PLL, and finally sideband aiding with a Kalman smoother. The average symbol signal to noise ratio (CNR) after losses due to carrier phase estimation error is computed for different total power SNRs, symbol rates and symbol SNRs. It is found that smoothing is most beneficial for low symbol SNRs and low symbol rates. Smoothing gains up to 0.4 dB over a sideband aided residual carrier PLL, and the combined benefit of smoothing and sideband aiding relative to a residual carrier loop is often in excess of 1 dB. Author

N86-14466*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

A CLASS OF OPTIMUM DIGITAL PHASE LOCKED LOOPS FOR THE DSN ADVANCED RECEIVER c33

R. Kumar and W. J. Hurd *In its* The Telecommunications and Data Acquisition Report 15 Nov. 1985 p 63-80 refs (For primary document see N86-14457 05-32)

Avail: NTIS HC A10/MF A01 CSCL 09A

A class of optimum digital filters for digital phase locked loop of the deep space network advanced receiver is discussed. The filter minimizes a weighted combination of the variance of the random component of the phase error and the sum square of the deterministic dynamic component of phase error at the output of the numerically controlled oscillator (NCO). By varying the weighting coefficient over a suitable range of values, a wide set of filters are obtained such that, for any specified value of the equivalent loop-noise bandwidth, there corresponds a unique filter in this class. This filter thus has the property of having the best transient response over all possible filters of the same bandwidth and type. The optimum filters are also evaluated in terms of their gain margin for stability and their steady-state error performance. Author

N86-14467*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

A LASER PLOTTING SYSTEM FOR VLSI CHIP LAYOUTS c33

J. A. Harding and L. J. Deutsch *In its* The Telecommunications and Data Acquisition Report 15 Nov. 1985 p 81-91 refs (For primary document see N86-14457 05-32)

Avail: NTIS HC A10/MF A01 CSCL 09C

One of the most time consuming facets of custom Very Large Scale Integration (VLSI) design is obtaining hardcopy plots of the mask geometries of cells and chips. The traditional method of generating these plots is to use a multicolor pen plotter. Pen plotters are inherently slow and the plotting speed increases linearly with the number of edges that must be plotted. A moderate custom chip design at the Jet Propulsion Laboratory (JPL) now consists of more than 200,000 such edges and can take as much as eight hours to plot using a pen plotter. Software is described that was written at JPL to produce similar plots using a laser printer. It is shown that, for rather small layouts, the laser printer can provide nearly instantaneous turnaround. For moderate to large chip designs, the laser printer provides a factor of five or more improvement is speed over pen plotting. Author

N86-14468*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

MARK 4-A DSCC TELEMETRY SYSTEM DESCRIPTION c17

D. L. Ross *In its* The Telecommunications and Data Acquisition Report 15 Nov. 1985 p 92-100 refs (For primary document see N86-14457 05-32)

Avail: NTIS HC A10/MF A01 CSCL 09F

An update is provided to the description of the Deep Space Communications Complex (DSSCC) portion of the MK IV-A Telemetry System. This system is currently being implemented at all signal processing centers. The Mark III Telemetry System is the predecessor of the Mark IV-A System. Author

N86-14469*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

COMPARISON OF GSFC AND JPL VLBI MODELING SOFTWARE: BENCHMARK c61

O. J. Sovers and C. Ma (NASA. Goddard Space Flight Center) *In its* The Telecommunications and Data Acquisition Report 15 Nov. 1985 p 101-112 refs (For primary document see N86-14457 05-32)

Avail: NTIS HC A10/MF A01 CSCL 09B

The Very Long Base Interferometry. The VLBI modeling software packages CALC 6.0 (GSFC) and MASTERFIT (JPL) are compared in some detail. Theoretical model delays are calculated for a set of 120 fictitious observations which involve a variety of sources, baselines, and antennas. Discrepancies between the total delays given by the two programs are of the order of 2 cm (RMS). The modeling of antenna offsets appears to account for approximately half of this difference. Relativistic bending contributions to the delay differ by 3 cm (RMS), and the there appears to be some mutual cancellation of errors involving antenna offsets, bending, and the effects of the two different Solar System ephemerides employed by CALC and MASTERFIT. This cancellation has not been completely characterized here. Author

N86-14470*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
CONTROLLER AND INTERFACE MODULE FOR THE HIGH-SPEED DATA ACQUISITION SYSTEM CORRELATOR/ ACCUMULATOR c35
S. S. Brokl *In its* The Telecommunications and Data Acquisition Report 15 Nov. 1985 p 113-124 refs (For primary document see N86-14457 05-32)
Avail: NTIS HC A10/MF A01 CSCL 14B

One complex channel of the High-Speed Data Acquisition System (a subsystem used in the Goldstone solar system radar), consisting of two correlator modules and one accumulator module, is operated by the controller and interface module interfaces are provided to the VAX UNIBUS for computer control, monitor, and test of the controller and correlator/accumulator. The correlator and accumulator modules controlled by this module are the key digital signal processing elements of the Goldstone High-Speed Data Acquisition System. This fully programmable unit provides for a wide variety of correlation and filtering functions operating on a three megaword/second data flow. Data flow is to the VAX by way of the I/O port of a FPS 5210 array processor. Author

N86-14471*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A GENERAL MONITOR AND CONTROL INTERFACE TO THE VAX UNIBUS BY WAY OF THE DR11-C I/O PORT c33
S. S. Brokl *In its* The Telecommunications and Data Acquisition Report 15 Nov. 1985 p 125-133 ref (For primary document see N86-14457 05-32)
Avail: NTIS HC A10/MF A01 CSCL 09C

The High Speed Data Acquisition System for the Goldstone Solar System Radar requires a number of interfaces for monitor and control functions for the special purpose data acquisition hardware. One common interface design is used. A large number of external control and monitor registers may be addressed and observed with this interface design, by using only three address locations on the UNIBUS and a standard DEC supplied input/output port. A broadcast control and status register is introduced which addresses any number of different units and registers. Author

N86-14472*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
MARK 4A PROJECT TRAINING EVALUATION
S. N. Stephenson *In its* The Telecommunications and Data Acquisition Report 15 Nov. 1985 p 134-164 refs (For primary document see N86-14457 05-32)
Avail: NTIS HC A10/MF A01 CSCL 17B

A participant evaluation of a Deep Space Network (DSN) is described. The Mark IVA project is an implementation to upgrade the tracking and data acquisition systems of the dSN. Approximately six hundred DSN operations and engineering maintenance personnel were surveyed. The survey obtained a convenience sample including trained people within the population in order to learn what training had taken place and to what effect. The survey questionnaire used modifications of standard rating scales to evaluate over one hundred items in four training dimensions. The scope of the evaluation included Mark IVA vendor training, a systems familiarization training seminar, engineering training classes, a on-the-job training. Measures of central tendency were made from participant rating responses. Chi square tests of statistical significance were performed on the data. The evaluation results indicated that the effects of different Mark INA training methods could be measured according to certain ratings of technical training effectiveness, and that the Mark IVA technical training has exhibited positive effects on the abilities of DSN personnel to operate and maintain new Mark IVA equipment systems. Author

N86-14473*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ERROR AND ERASURE PROBABILITIES FOR GALILEO UPLINK CODE
J. B. Berner, R. J. McEliece (California Inst. of Tech.), and E. C. Posner *In its* The Telecommunications and Data Acquisition Report 15 Nov. 1985 p 165-179 refs (For primary document see N86-14457 05-32)
Avail: NTIS HC A10/MF A01 CSCL 17B

The Galileo uplink Frame Erasure probability and Undetected Frame Error probability are derived. The performance meets desired specification under normal operations. The Galileo command system will work well even in an emergency condition, where the bit error rate into the command decoder is 1.00 X 0.001 (although Galileo's command threshold error rate is 1.00 X 0.00001). Author

N86-14474*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A WIDE-BAND, HIGH-RESOLUTION SPECTRUM ANALYZER c35
M. P. Quirk, H. C. Wilck, and M. J. Grimm *In its* The Telecommunications and Data Acquisition Report 15 Nov. 1985 p 180-190 refs (For primary document see N86-14457 05-32)
Avail: NTIS HC A10/MF A01 CSCL 14B

A million-channel, 20 MHz-bandwidth, digital spectrum analyzer under evelopment for use in the SETI Sky Survey and other applications in the Deep Space Network is described. The analyzer digitizes an analog input, performs a 2(20)-point Radix-2, Fast Fourier Transform, accumulates the output power, and normalizes the output to remove frequency-dependent gain. The effective speed of the real-time hardware is 2.2 GigaFLOPS. Author

N86-14475*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A SIGNAL DETECTION STRATEGY FOR THE SETI ALL SKY SURVEY c89
J. Solomon, W. Lawton, M. P. Quirk, and E. T. Olsen *In its* The Telecommunications and Data Acquisition Report 15 Nov. 1985 p 191-208 refs (For primary document see N86-14457 05-32)
Avail: NTIS HC A10/MF A01 CSCL 03A

A source detection strategy for the SETI All Sky Survey is described. The method is designed to detect continuous wave (or very narrowband) sources transitting an antenna beam. The short-time spectra of the received signal are accumulated, and candidate extraterrestrial sources are recognized by the recognized by the presence of narrowband power exceeding a threshold function. The threshold function is derived using a Neyman-pearson hypothesis test. Author

N86-14476*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE NUMBER OF STABLE POINTS OF AN INFINITE-RANGE SPIN GLASS MEMORY c27
R. J. McEliece (California Inst. of Tech.) and E. C. Posner *In its* The Telecommunications and Data Acquisition Report 15 Nov. 1985 p 209-215 refs (For primary document see N86-14457 05-32)
Avail: NTIS HC A10/MF A01

A rigorous asymptotic expression for the number of stable points of an infinite-range spin glass with independently identically distributed (i.i.d) zero-mean gaussian exchange interactions is discussed. The result also applies tot he number of stable points of a Hopfield Memory (a kind of associative memory) when the memory connections are i.i.d. zero-mean gaussians. The result is that the number of stable points is asymptotic to a constant slightly larger than 1 times 2 to a power slightly larger thann/4, where n is the number of spins in the glass, or the length of the n-tuples to be remembered by the memory. The answer is easily derived using simple asymptotic techniques from an exact expression for the probability that an arbitrary plus or minus 1 n-tuple of spins is a fixed point. This expression is obtained from the fact that any distribution of joint zero-mean gaussians of given covariances is specified solely by these covariances. This is a far shorter derivation of the result than those existing. Author

N86-14477*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SECONDARY PATTERN COMPUTATION OF AN ARBITRARILY

SHAPED MAIN REFLECTOR Final Report
Peter T. C. Lam (Illinois Univ., Urbana), S. W. Lee (Illinois Univ., Urbana), and R. J. Acosta Nov. 1985 120 p refs Previously announced as N84-25909
(NASA-TM-87162; E-2796; NAS 1.15:87162) Avail: NTIS HC A06/MF A01 CSCL 20N

The secondary pattern of a perfectly conducting offset main reflector being illuminated by a point feed at an arbitrary location is studied. The method of analysis is based upon the application of the Fast Fourier Transform (FFT) to the aperture fields obtained using geometrical optics (GO) and geometrical theory of diffraction (GTD). Key features of the present work are (1) the reflector surface is completely arbitrary, (2) the incident field from the feed is most general with arbitrary polarization and location, and (3) the edge diffraction is calculated by either UAT or by UTD. Comparison of this technique for an offset parabolic reflector with the Jacobi-Bessel and Fourier-Bessel techniques shows good agreement. Near field, far field, and scan data of a large refelctor are presented. Author

N86-14478*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ANALOG FM/FM VERSUS DIGITAL COLOR TV TRANSMISSION ABOARD SPACE STATION
Michael M. Hart Oct. 1985 16 p ref
(NASA-TM-87578; NAS 1.15:87578) Avail: NTIS HC A02/MF A01 CSCL 17B

Langley Research Center is developing an integrated fault tolerant network to support data, voice, and video communications aboard Space Station. The question of transmitting the video data via dedicated analog channels or converting it to the digital domain for consistancy with the test of the data is addressed. The recommendations in this paper are based on a comparison in the signal-to-noise ratio (SNR), the type of video processing required aboard Space Station, the applicability to Space Station, and how they integrate into the network. Author

N86-14479*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SECONDARY PATTERN COMPUTATION OF AN OFFSET REFLECTOR ANTENNA
Roberto J. Acosta Nov. 1985 20 p refs
(NASA-TM-87160; E-2791; NAS 1.15:87160) Avail: NTIS HC A02/MF A01 CSCL 20N

Reflector antennas are widely used in communications satellite systems because they provide high gain at low cost. In analyzing reflector antennas the computation of the secondary pattern is the main concern. A computer program for calculating the secondary pattern of an offset reflector has been developed and implemented at the NASA Lewis Research Center. The theoretical foundation for this program is based on the use of geometrical optics to describe the fields from the feed to the reflector surface and to the aperture plane. The resulting aperture field distribution is then transformed to the far-field zone by the fast Fourier transform algorithm. Comparing this technique with other well-known techniques (the geometrical theory of diffraction, physical optics (Jacobi-Bessel), etc.) shows good agreement for large (diameter of 100 lambda or greater) reflector antennas. Author

N86-14480# IIT Research Inst., Chicago, Ill.
ELF (EXTREMELY LOW FREQUENCY) COMMUNICATIONS SYSTEM ECOLOGICAL MONITORING PROGRAM: MEASUREMENTS OF ELF ELECTROMAGNETIC FIELDS FOR SITE SELECTION AND CHARACTERIZATION-1984
R. M. Brosh, J. R. Gauger, and J. E. Zapotosky Jun. 1985 134 p
(Contract N00039-84-C-0070)
(AD-A158360; IITRI-E06549-14) Avail: NTIS HC A07/MF A01 CSCL 06/18

A long-term program for studying possible effects from the operation of the Navy's ELF Communications System is being conducted on biota and ecosystems components in north-western Wisconsin and the Upper Peninsula of Michigan. Sixteen general types of organisms from three major ecosystems in the ELF system area are being examined. Formulation of an ELF Ecological Monitoring Program was completed in early 1982 by the Department of the Navy. Monitoring studies were conducted through a peer-reviewed, competitive bidding process in mid-1982, and studies were initiated in late summer of the same year. Beginning in 1983 and continuing during 1984 major activities of the program consisted of characterization of critical apsects of each study, collection of data to validate assumptions made in proposals, and selection of study sites. Measurements of electromagnetic fields at the investigator-selected sites are documented, and the acceptability and status of the sites in light of the electromagnetic exposure criteria are discussed. GRA

N86-14481# Polytechnic Inst. of New York, Farmingdale. Microwave Research Inst.
QUASI-OPTIC STUDY OF DIELECTRIC RADOMES AND LENSES Final Report, 29 Mar. 1982 - 28 Jun. 1985
L. B. Felsen 1 Aug. 1985 10 p
(Contract DAAG29-82-K-0097)
(AD-A158441; POLY-MRI-1444-85; ARO-18887.7-EL) Avail: NTIS HC A02/MF A01 CSCL 17/9

The results from this study confirm the utility of complex ray tracing (via ordinary complex rays, collective complex rays or hybrid forms) for Gaussian beam type fields transmitted through tapered or curved two-dimensional shell radomes. The numerical algorithm, which avoids the need for integrations over an equivalent aperture when passing from the near zone to the far zone, can be simplified substantially for a range of applications by recourse to paraxial approximations. These conclusions are expected to remain valid also for more general three-dimensional configurations. Although non-Gaussian aperture distributions are not well modeled by complex ray fields per se, recent studies indicate that general aperture fields can be expressed as discrete superpositions of Gaussian fields. This makes the results for single Gaussians reported here directly relevant for the tracking, via obstacles and interfaces, of this more general class of incident fields. GRA

N86-14482# Mission Research Corp., Alexandria, Va.
MICROWAVE INTERACTION WITH AIR
D. Pershing and W. M. Bollen Jun. 1985 45 p
(Contract N00014-83-M-0262)
(AD-A158447; MRC/WDC-R-097) Avail: NTIS HC A03/MF A01 CSCL 04/1

Microwave breakdown studies of gaseous elements have been carried out extensively over a wide range of pressures and for several microwave frequencies using CW and pulsed radiation sources. The main emphasis in these studies was on the determination of the breakdown power threshold and its dependence on the gas pressure and the microwave frequency. The coupling of mircowave energy into the breakdown plasma and neutral gas has not been studied in detail. The reason for this is that, until recently, no high-power microwave sources have been available to perform such studies. Most of the early work performed on breakdown thresholds was performed using high Q-cavities to obtain the necessary electric field to break down the gas. Once breakdown of the gas occurred, the Q of the cavity dropped and the interaction changed. Using the NRL high-power gyrotron facility, we have been able to eliminate the need for cavities and have performed experiments using a focused geometry to examine the coupling of microwave energy to nitrogen gas during breakdown. We have also modeled the experiments using a 1-D computer simulation code. Simulations were performed in a spherical geometry using a self-consistent, nitrogen chemistry, wave optics, microwave breakdown simulation code, MINI. The main emphasis of past work was on the ionization front created during nitrogen breakdown and its motion and plasma properties, as observed experimentally. GRA

N86-14483# Naval Research Lab., Washington, D. C.
SPECIFICATIONS FOR THREE MEMBERS OF THE MILITARY MESSAGE SYSTEM (MMS) FAMILY Memorandum Report, Nov. 1981 - May 1985

C. L. Heitmeyer and M. R. Cornwell 9 Sep. 1985 41 p
(AD-A158455; NRL-MR-5645) Avail: NTIS HC A03/MF A01 CSCL 17/2

This report presents informal specifications for the user commands supported by three message systems, all members of the Military Message System (MMS) family. The message systems constitute a family because it is worthwhile to study their similarities before studying their differences. The members of the MMS family share a common definition of security. This report is intended to be an example of both good requirements documentation and an appropriate design for a secure message system. GRA

N86-14484# IIT Research Inst., Chicago, Ill.
COMPILATION OF 1984 ANNUAL REPORTS OF THE NAVY ELF (EXTREMELY LOW FREQUENCY) COMMUNICATIONS SYSTEM ECOLOGICAL MONITORING PROGRAM. VOLUME 1: TABS A-E Annual Progress Report, Jan. - Dec. 1984
M. Anderson, J. Bruhn, P. Cattelino, M. Jurgensen, and G. W. Lenz Jun. 1985 500 p
(Contract N00039-84-C-0070)
(AD-A159184; IITRI-E06549-17-Vol-1) Avail: NTIS HC A21/MF A01 CSCL 06/6

A long-term program of monitoring for possible ELF electromagnetic influences on ecosystems in northwestern Wisconsin and the Upper Peninsula of Michigan, is being conducted. Selection of study sites, monitoring protocols, and analytical methods were initiated in 1982. These activities, as well as data collection, were continued during 1983 and 1984. Progress is described for studying the terrestrial, aquatic, and wetland ecosystems for the 11 projects comprising the Ecological Monitoring Program. GRA

N86-14485# IIT Research Inst., Chicago, Ill.
COMPILATION OF 1984 ANNUAL REPORTS OF THE NAVY ELF (EXTREMELY LOW FREQUENCY) COMMUNICATIONS SYSTEM ECOLOGICAL MONITORING PROGRAM. VOLUME 2: TABS F-K Annual Progress Report, Jan. - Dec. 1984
R. L. Fischer, D. L. Beaver, J. H. Asher, R. W. Hill, and T. M. Burton Jun. 1985 500 p
(Contract N00039-84-C-0070)
(AD-A159185; IITRI-E06549-17-Vol-2) Avail: NTIS HC A21/MF A01 CSCL 06/6

A long term program of monitoring for possible ELF electromagnetic influences on ecosystems in northwestern Wisconsin and the Upper Peninsula of Michigan is being conducted. Selection of study sites, monitoring protocols, and analytical methods were initiated in 1982. These activities, as well as data collection, were continued during 1983 and 1984. Progress is described for studying the terrestrial, aquatic, and wetland ecosystems for the 11 projects comprising the Ecological Monitoring Program. GRA

N86-14486# CNR, Inc., Needham, Mass.
ADAPTIVE COMBINING APPLIED TO NOISY NETWORKS Final Report
5 Aug. 1985 91 p
(Contract N00019-84-C-0091)
(AD-A159192) Avail: NTIS HC A05/MF A01 CSCL 17/2

This report's purpose is two-fold: first to present an in-depth study of code combining using both analytical and empirical methods and secondly to evaluate its effectiveness in various communication scenarios, particularly its use in ARQ systems. On very noisy channels, code combining allows significant throughput where other coding techniques fail. It can also be used to adaptively optimize the code rate on unknown or varying channels. Finally these features can be provided by incorporating code combining into existing communication schemes such as ARQ. Code combining is a technique for combining any number of repeated packets encoded with a rate-R code to obtain a lower rate, and thus more powerful, error-correcting code. The conclusions of this report are that we have: (1) Derived and applied analytic expressions describing the performance of code combining; (2) Developed a decoding algorithm which simplifies the implementation of a maximum-likelihood code combiner; (3) Proposed and analyzed new techniques for using code combining including relaying of undecoded packets, early decoding of header information and production of rate-1/N codes; and (4) Established the performance of code combining in both ideal and practical selective-repeat ARQ systems. Together these results constitute a significant contribution to the understanding and application of code combining. GRA

N86-14487# Office of Naval Research, London (England).
AGARD LECTURE SERIES ON THE IMPACT OF PROPOSED RADIO FREQUENCY RADIATION STANDARDS ON MILITARY OPERATIONS Conference Report
T. C. Rozzell 12 Jun. 1985 15 p
(AD-A159206; ONRL-C-6-85) Avail: NTIS HC A02/MF A01 CSCL 13/12

During April 1985, the North Atlantic Treaty Organization's Advisory Group for Aerospace Research and Development (AGARD) held a lecture series dealing with the impact of proposed and existing radio-frequency (RF) radiation standards on military operations. This report discusses presentations on specific absorption rate and RF energy, biological effects of RF energy, long-term exposure, accidental exposure, epidemiological studies, power-line frequencies, very low frequency to medium frequency hazards, exposure standards, and measurement problems. The appendix provides background on AGARD and its lecture series. GRA

N86-14488# Army Missile Command, Redstone Arsenal, Ala. Test and Evaluation Directorate.
ELECTROMAGNETIC SHIELDING MEASUREMENTS - NMR (NUCLEAR MAGNETIC RESONANCE) ENCLOSURE, UNIVERSITY OF ALABAMA AT BIRMINGHAM
B. L. Hooks and D. W. Aughinbaugh 21 Dec. 1984 36 p
(AD-A159281; AD-E950743; AMSMI/RT-85-6-TR) Avail: NTIS HC A03/MF A01 CSCL 20/14

These are the results of an EMI (Electromagnetic Shielding Measurements) shielding effectiveness test of the screened enclosure to be used for the Nuclear Magnetic Resonance Chamber at the University of Alabama in Birmingham. Author (GRA)

N86-14489# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
CODE SEQUENCE PERFORMANCE ANALYSIS USING CROSS-CORRELATION PARAMETERS IN PHASE-CODED MULTIPLE ACCESS COMMUNICATION SYSTEMS M.S. Thesis
R. C. Gonder Jun. 1985 187 p
(AD-A159309; AD-F250300; AFIT/GE/ENG/85J-1) Avail: NTIS HC A09/MF A01 CSCL 17/2

This thesis documents a technique to compare cross-correlation parameters of binary sequences used for spread-spectrum multiple-access radio communications systems, by performing a thresholding process on the correlation functions. The performance of Maximal length, Gold and Kasami code sequences is measured and analyzed for code lengths ranging from 63 to 1023. Comparisons of optimized codes versus unoptimized codes for each type of code sequence are analyzed in terms of the thresholding process. Comparisons are made on the performance of code sequences and code sets at lenghts of 63, 127, 255, and 1023. The software used to analyze the codes is discussed in terms of structure and performance, and is included as appendices in the thesis. The results of this investigation indicate that the thresholding process can be used to evaluate binary sequence performance. Author (GRA)

N86-14490# Kanter (Irving), Lexington, Mass.
EXACT DETECTION PROBABILITY AND FLUCTUATION LOSS FOR A PARTIALLY CORRELATED RAYLEIGH TARGET
I. Kanter Jul. 1985 47 p
(Contract DAAG29-81-C-0100)
(AD-A159457; AD-E950749; AMSMI/RE-CR-85-3) Avail: NTIS HC A03/MF A01 CSCL 17/9

Theoretical methods are well known for the determination of the probability of detection for fluctuating and non-fluctuating targets when N pulses of signal pulse noise are integrated

incoherently. Previously, correlation of the pulses has been considered to be complete or nonexistent during the integration time. This analysis extends the detection theory to include detection of the sum of N partially correlated pulses. A Rayleigh target whose in-phase and quadrature components have exponential correlation is used as the model. The fluctuation loss for a Gauss-Markov signal is determined as a function of number of pulses integrated, the correlation between pulses, and the specified detection and false alarm probabilities. This exact loss is compared to Barton's approximation. Author (GRA)

N86-14491# Lawrence Livermore National Lab., Calif.
NUMERICAL MODELING OF SUBSURFACE COMMUNICATION, REVISION 1
G. J. Burke, C. G. Dease, E. M. Didwall, and R. J. Lytle Aug. 1985 42 p
(Contract W-7405-eng-48)
(DE85-017324; UCID-20439-Rev-1) Avail: NTIS HC A03/MF A01

Techniques are described for numerical modeling of through-the-Earth communication. The basic problem considered is evaluation of the field at a surface or airborne station due to an antenna buried in the earth. Equations are given for the field of a point source in a homogeneous or stratified Earth. These expressions involve infinite integrals over wave number, sometimes known as Sommerfeld integrals. Numerical techniques used for evaluating these integrals are outlined. The problem of determining the current on a real antenna in the Earth, including the effect of insulation, is considered. Results are included for the fields of a point source in homogeneous and stratified earths and the field of a finite insulated dipole. The results are for electromagnetic propagation in the ELF-VLF range, but the codes also can address propagation problems at higher frequencies. DOE

N86-14492# Lawrence Livermore National Lab., Calif.
ELF-VLF COMMUNICATIONS THROUGH THE EARTH PROJECT REPORT FOR CALENDAR YEAR 1984, REVISION 1
H. M. Buettner, G. J. Burker, E. M. Didwall, G. Holladay, and R. J. Lytle Aug. 1985 89 p
(Contract W-7405-eng-48)
(DE85-017319; UCID-20473-Rev-1) Avail: NTIS HC A0/MF A01

We use computer models and experiments to explore the feasibility of communication between points underground and on the Earth's surface. Emphasis is placed on ELF-VLF electromagnetic propagation through the Earth; nominally, we investigated propagation in the 200 Hz-30 kHz frequency range. The computer modeling included calculations of the fields of a point electric or magnetic source in a homogeneous half space or a stratified earth. Initial results for an insulated antenna of finite length are also considered. The experiments involved through-the-Earth transmissions at two locations in Pennsylvania, both of which had large formations of limestone. Initial results indicate that information rates as high as kbits/s may be possible for subsurface depths of 300 m or less. Accuracy of these estimates depends on the electromagnetic propagation constant of the rock, the noise characteristics, and the modulation scheme. Although a nuisance for evaluating through-the-Earth propagation, the existence of subsurface metal conductors can improve the transmission character of the site. DOE

N86-14493# Oak Ridge National Lab., Tenn.
NUCLEAR ELECTROMAGNETIC PULSE (EMP) PROTECTION MANUAL FOR EMERGENCY BROADCAST RADIO STATIONS AND EMERGENCY OPERATIONS CENTERS
R. I. Crutcher, M. E. Buchanan, D. C. Aqouridis, D. B. Clark, and R. P. Gates, II Jun. 1985 485 p
(Contract DE-AC05-84OR-21400)
(DE85-013548; ORNL-6131) Avail: NTIS HC A21/MF A01

This document presents the information and data required to provide retrofit electromagnetic pulse (EMP) protection for facilities included in the Federal Emergency Management Agency's protection programs. An introduction and orientation to the FEMA program are provided in Section 1. Sections 2 and 3 cover the generation of EMP and its coupling into systems. Section 4 compares natural lightning and EMP. The EMP hardening approach adopted by FEMA is presented in Section 5. Section 6 covers the protection devices, their characteristics, and applications. The facility life-support equipment protection is presented in Section 7. Sections 8, 9, and 10 cover the facility site survey, the survey report, and the protector installation. Maintenance and testing of EMP protectors are discussed in Section 11. DOE

N86-14494# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Space Div.
FUTURE COMMUNICATION SPACE SEGMENT. COMPARISON STUDY OF EUROPEAN CONCEPTS. VARIABLE CONFRONTATION CONTROL
Paris ESA Jul. 1983 219 p refs Prepared in cooperation with ERNO Raumfahrttechnik GmbH, Bremen, West Germany and Logica Ltd., London
(Contract ESTEC-4817/81/NL-MD)
(MBB-URV-134/83; ESA-CR(P)-2065) Avail: NTIS HC A10/MF A01

Technical solutions for cost effective implementation and management of the space segment of a European telecommunication network for the 1990's were compared. The most promising concept is an Ariane launched modular platform where the program cost could be lowered to 44% (depriciation rate 0 %) of a reference system with a conventional concept and design. A cost advantage of a cluster type concept is not observed. Comparing individual satellite systems with modular assembly concepts (with a sharing of the service functional bus system) the cost break even point is reached after the third payload module is docked to the central service modules. High system reliability requirements could be covered after the attachment of the second transfer orbit docking system to the service module satellite. Potential benefits of a European satellite assembly system are high due to its modular approach and the inherent high service bus system reliability. The GEO-assembly approach shows high mission flexibility and could provide a good payload adaptability to varying demands, and soft system start-up cost. Author (ESA)

N86-14495# Technische Hogeschool, Eindhoven (Netherlands). Afd. der Elektrotechniek.
DEFINITION OF IMR ANTENNA TEST TECHNIQUES Final Report
V. J. Vokurka Paris ESA 14 Sep. 1984 102 p refs
(Contract ESA-4642/81/NL-PP(SC))
(ESA-CR(P)-2068) Avail: NTIS HC A06/MF A01

Compact antenna test ranges (CR) with two cylindrical reflectors are compared with other indoor techniques. It is shown that only CR create an electromagnetic field environment suitable for far field simulation. The reflectivity level of CR is better than that of other (indoor and outdoor) ranges. Levels as low as -70 dB are realistic; this implies that an important source of errors in pattern measurements is eliminated. The cross-polar level is relatively high for linear polarization (vertical plane only), but accurate cross-polar measurements are possible. Errors due to amplitude taper are acceptable even for antennas which occupy $>$ 60% of the CR dimension (linear). Phase characteristics are almost perfect. Author (ESA)

N86-14496# AOA Apparatebau Gauting G.m.b.H. (West Germany).
LOCALIZATION FINDING SYSTEM OF OPERATIONAL VEHICLES IN URBAN DISTRICTS Final Report, Apr. 1983
Werner Weisser Bonn Bundesministerium fuer Forschung und Technologie Jun. 1985 65 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-85-055; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 13

A vehicle passive radio localization system (Automatic Vehicle Position Finding System) was developed to allow the localization of and data transmission to vehicles on missions in urban areas. The system operates economically, based on the difference in

transit time principle. The system is characterized by a continued absolute position determination from hyperbolic coordinates with central conversion into geographic coordinates using personal computers, by transit time assessment of aperiodic signals, and automatic transmission of the position data. The system can be used for multiplex operations, automatic monitoring and control and can be integrated in a complete system. Author (ESA)

N86-14497# Fondazione Ugo Bordoni, Rome (Italy).
METHODS FOR PLANNING TELECOMMUNICATION NETWORKS (COST 201 PROJECT) [METODI PER LA PIANIFICAZIONE DI RETI DI TELECOMUNICAZIONI (PROGETTO COST 201)]
Ugo Mocci and Alberto Tonietti Aug. 1984 12 p refs In ITALIAN Presented at the 32nd Convention of International Communication, Genoa, Oct. 1984
(FUB-19-1984) Avail: NTIS HC A02/MF A01

The results and possible applications of the COST 201 project, finished in 1983, are discussed. This multinational project (11 nations) intended to optimize the dimensioning of telecommunication networks taking account of cost and service quality. The main results are the development of a computer program for network planning and the experience gained in international cooperation. Author (ESA)

N86-14653# Technical Univ. of Cracow (Poland).
ENTROPY IN RANDOM CAPACITY ESTIMATION
Alfred Sowa and Tomasz Domanski *In* Technical Univ. of Brno Design Limit States of Steel Structures: 1st International Correspondence Conference 1983/84, Vol. 1 1983 p 106-114 refs (For primary document see N86-14644 05-39)
Avail: Issuing Activity

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

N86-14498*# National Aeronautics and Space Administration, Washington, D.C.
HIGH-DENSITY DIGITAL RECORDING
Ford Kalil, ed. and Al Buschman, ed. (Naval Intelligence Support Center, Suitland, Md.) Sep. 1985 319 p refs
(NASA-RP-1111; NAS 1.61:1111) Avail: NTIS HC A14/MF A01 CSCL 01C

The problems associated with high-density digital recording (HDDR) are discussed. Five independent users of HDDR systems and their problems, solutions, and insights are provided as guidance for other users of HDDR systems. Various pulse code modulation coding techniques are reviewed. An introduction to error detection and correction head optimization theory and perpendicular recording are provided. Competitive tape recorder manufacturers apply all of the above theories and techniques and present their offerings. The methodology used by the HDDR Users Subcommittee of THIC to evaluate parallel HDDR systems is presented. E.A.K.

N86-14499*# SRI International Corp., Menlo Park, Calif.
DEVELOPMENT PROGRAM ON A COLD CATHODE ELECTRON GUN Annual Report
C. A. Spindt and C. E. Holland Jan. 1985 70 p refs
(Contract NAS3-23776; SRI Proj. 5723)
(NASA-CR-174792; NAS 1.26:174792) Avail: NTIS HC A04/MF A01 CSCL 09A

During this phase of the cathode development program, SRI improved the multiple electron beam exposure system used to print hole patterns for the cathode arrays, studied anisotropic etch processes, conducted cathode investigations using an emission microscope, reviewed possible alternate materials for cathode fabrication, studied cathode storage techniques, conducted high power operation experiments, and demonstrated high-current-density operation with small arrays of tips. Author

N86-14500# Department of the Air Force, Washington, D.C.
MODULATION DOPED GaAs/AlGaAs FIELD EFFECT TRANSISTOR Patent Application
M. B. Das, inventor (to Air Force) Filed 27 Jun. 1985 24 p
(AD-D011806; US-Patent-Appl-SN-749368) Avail: NTIS HC A02/MF A01 CSCL 09/1

To realize a depletion-mode modulation-doped field-effect transistor with high gate-length to depletion-depth ratio that is capable of providing high power gain at millimeter-wave frequencies, an ohmic gate or a heterojunction gate is used on the n-AlGaAs/GaAs layered structure, replacing the prior art Schottky-barrier metal gate. The depletion-mode operation is desirable for analog signal amplifying circuits as opposed to the enhancement-mode device commonly used for switching or digital circuits. In the case of Schottky-barrier gate, high aspect ratio structures naturally operate in the enhancement mode, hence the need for the change in the gate electrode structure. Author (GRA)

N86-14501# Massachusetts Inst. of Tech., Cambridge. Dept. of Chemistry.
A MICROELECTROCHEMICAL DIODE WITH SUBMICRON CONTACT SPACING BASED ON THE CONNECTION OF TWO MICROELECTRODES USING DISSIMILAR REDOX POLYMERS Interim Technical Report
G. P. Kittlesen, H. S. White, and M. S. Wrighton 16 Aug. 1985 42 p
(Contract N00014-85-K-0553)
(AD-A158283; TR-7-ONR) Avail: NTIS HC A03/MF A01 CSCL 09/1

Closely spaced, 0.2-1 micrometer, Au microelectrodes on Si3N4 can be functionalized with polyvinylferrocene, PVFc(+)/(o), or with an N, N'- dibenzyl-4,4'-bipyridinium-based polymer, (BPQ (2+)/(+)n, derived from hydrolysis of N, N'-bis((P-trimethoxysilyl) benzyl)-4-4'bipyridinium, I. Two or eight-microelectrodes arrays can be connected with either polymer in the sense that net current can pass from one microelectrode to another, through the polymer, when one electrode is held at a potential where the polymer is oxidized and the other electrode is held at a potential where the polymer is reduced. From such steady state current an estimate of the diffusion coefficient for charge transport, DCT, in the polymer can be made; values in the range .000000001- 10 to the --10 power sq cm/s are found and accord well with earlier measurements of DCT for the polymers studies. A two-terminal diode can be fabricated by coating one electrode with (BPQ(2+)/(+))n and an adjacent electrode with PVFc(+)/(o) such that there is a connection between the microelectrodes via the (BPQ(2+)/(+)n/PVFc(+) /(o) contact. Current passes when the applied potential is such that negative lead is attached to the PVFc(2+)/(+)n-coated electrode and the positive lead is attached to the PVFc(;)/(o)-coated electrode. The switching time of a microelectrochemical diode is controlled by the time required to oxidize and reduce the polymers. GRA

N86-14502# Rensselaer Polytechnic Inst., Troy, N.Y.
AN EXTENSION OF THE ENGEL-BREWER METALLIC CORRELATION TO TRANSITION METAL SILICIDES
S. Sivaram, P. J. Ficalora, and K. C. Cadien Aug. 1985 27 p
(Contract N00014-81-K-0605)
(AD-A158294) Avail: NTIS HC A03/MF A01 CSCL 20/12

Transition metal silicides are of considerable technological importance. In integrated circuits, they are used as gate electrodes, Schottky barriers and as ohmic contacts. In spite of the large amount of research being done on these materials, there is very little understanding of the physical and chemical factors that determine the material properties. The reason for the lack of progress is best demonstrated by considering the crystal structure. The crystal structures of all transition metal silicides fall into just

four crystal systems (cubic, hexagonal, orthorhombic and tetragonal). However, any analysis is made extremely difficult by the complexity of the different atom coordinations. In addition, the ground state electronic configurations of the gaseous atoms do not necessarily represent the electronic states of the atoms in the solid components. Thus, predicting electrical properties based on the ground state configuration leads to erroneous results. In this paper, we extend the well-known Engel-Brewer correlation for transition metals to transition metal silicides. Properties, such as resistivity, crystal structure, thermodynamic stability, bulk density, heat of formation and thermal expansion coefficient will be correlated to the promoted electronic state. We will show this correlation to be a useful predictive mode. GRA

N86-14503# Delaware Univ., Newark. Dept. of Physics.
THIN-FILM ELECTROLUMINESCENCE Final Report, 14 Mar. 1983 - 13 Mar. 1985
J. E. Bernard, G. Negley, S. Sarwate, C. B. Cooper, and F. E. Williams 10 Jul. 1985 10 p
(Contract DAAG29-83-K-0060)
(AD-A158352; ARO-19183.1-PH) Avail: NTIS HC A02/MF A01 CSCL 09/1

This project involved further theoretical and experimental work on thin film electroluminescence (TFEL) devices. A theoretical study was carried out to calculate the cross sections of collision excitation processes of the luminescence centers in TFEL devices. Cross sections for ZnS:Mn(2+), ZnF2:Mn; ZnS:TbF3, AnF2:TbF3, Y2O3:Tb(3+), and Y2O3:Eu(3+). Experiments were begun to fabricate EL cells designed for the purpose of measuring the energy distribution of the hot carriers in TFEL devices; to get a better idea of the quantitative electrical behavior of TFEL cells; and to estimate at the range of hot carriers in ZnF2Mn films.
Author (GRA)

N86-14504# California Univ., Santa Barbara. Dept. of Electrical and Computer Engineering.
MOLECULAR-BEAM EPITAXIAL GROWTH AND DEVICE POTENTIAL OF POLAR/NONPOLAR SEMICONDUCTOR HETEROSTRUCTURES Final Report, 1 Aug. 1977 - 31 Mar 1985
H. Kroemer 24 Jun. 1985 10 p
(Contracts DAAG29-77-C-0041; DAAG29-81-K-0143)
(AD-A158353; ARO-14570.5-EL; ARO-18464.8-EL) Avail: NTIS HC A02/MF A01 CSCL 20/2

Techniques for the molecular beam epitaxial growth of GaP and GaAs substrates were developed. The techniques rely on the total in-situ removal of all oxygen from the Si surface, to create an atomically clean Si starting surface, coupled with the use of the unusual and previously not used crystallographic (211) orientation for the Si substrate. In the case fo GaP growth a third essential ingredient was the use of pure P2 vapor, generated by the high-temperature decomposition of GaP, rather than the P4 vapor generated by the evaporation of elemental phosphorus. The central problem of obtaining device-quality growth of GaAs and GaP was found to be the problem of avoiding antiphase domains (APDs) in the growing film, that is, of random domains containing opposite assignments of the lattice positions to the Ga and P atoms. On the commonly used crystallographic (100) orientation, APDs are fundamentally unavoidable. The (211) orientation was recognized to have a bond configuration at the interface such that APDs should not form. Experimental (211) growths yielded layers of high quality that were demonstrably free of APDs, as predicted. The recognition of the (211) orientation as the canonical orientation for the growth of polar compound semiconductors on non-polar elemental semiconductor substrates was a completely unexpected result of this research, and perhaps the most far-reaching one. GRA

N86-14505# Mississippi State Univ., Mississippi State. Dept. of Electrical Engineering.
BULK CMOS VLSI TECHNOLOGY STUDIES. PART 1: SCALABLE CMOS DESIGN RULES. PART 2: CMOS APPROACHES TO PLA (PROGRAMMABLE LOGIC ARRAY) DESIGN Final Report, Aug. 1982 - Feb. 1985
J. D. Trotter and A. K. R. Naini 17 Jun. 1985 183 p
(Contract DAAG29-82-K-0167)
(AD-A158367; ARO-19839.1-EL-A-Pt-1/2) Avail: NTIS HC A09/MF A01 CSCL 09/5

Part 1: Scalable CMOS design rules are developed for the MOSIS community to facilitate fabrication from a single design at 3 microns and 1.3 microns VHSIC dimensions. Part 2: Various Programmable Logic Array (PLA) implementations with clocked CMOS technology are explored in this project. Three different CMOS PLA circuit styles are described: the large PLA uses a gated OR plane and is useful for a system with large number of inputs; the moderate PLA and the small PLA are ripple varieties with the former having the capability of handling a larger number of inputs than the latter. Path Programmable Logic (PPL), which is a folded form of a PLA, is also studied. A symbolic form of representation is developed and future PPL development activities are discussed. The PPL approach has a size and flexibility advantage over the other PLA approaches except in applications requiring large PLA's. GRA

N86-14506# Mississippi State Univ., Mississippi State. Dept. of Electrical Engineering.
BULK CMOS VLSI TECHNOLOGY STUDIES. PART 3: A 1.2 MICRON CMOS DATA PATH CHIP Final Report, Aug. 1982 - Feb. 1985
J. D. Trotter and C. W. Jones 17 Jun. 1985 184 p
(Contract DAAG29-82-K-0167)
(AD-A158368; ARO-19839.1-EL-A-Pt-3) Avail: NTIS HC A09/MF A01 CSCL 09/5

A 16-bit, 1.2 micron CMOS data path chip is presented. The chip consists of two I/O ports, a 22 register scratch pad memory, a general purpose ALU, and a barrel shifter. The chip is designed to operate with a two-phase clock and is microcode controlled by a 22-bit phase 1 microword and a 13-bit phase 2 microword. The chip has a 64-pad frame with 3 pads not connected. The circuitry and layouts for this data path chip are presented. How the chip can be functionally tested is included, and enhancements for a second generation chip are discussed. GRA

N86-14507# Purdue Univ., West Lafayette, Ind. School of Electrical Engineering.
DEVELOPMENT OF SHAPE ANALYSIS ALGORITHMS Final Report, Jun. 1981 - Apr. 1985
O. R. Mitchell Jul. 1985 16 p
(Contract DAAG29-81-K-0088)
(AD-A158496; ARO-18016.15-EL-A) Avail: NTIS HC A02/MF A01 CSCL 17/8

This report summarizes the results of a 4 year research effort. The primary research topic addressed is automatic shape recognition of silhouettes or contours. Methods studied are Fourier descriptors, Walsh descriptors, and 2-D moments. Also the recognition of partially correct shapes are addressed. Three methods were developed to solve such problems. These methods are: (1) polygonal fitting of a boundary followed by local matching of distances and angles; (2) Fourier descriptor representation of boundary segments followed by dynamic programming to match segments (dynamic programming is modified to allow several local optimums instead of one global optimum; and (3) recognition of time-axis scaling and matches between two partially matching waveforms using Mellin Transform techniques. Other research topics addressed by this summary are: (1) registration and segmentation of moving objects; (2) measurement and recognition using 3-D range data; (3) image compression using motion detection; and (4) precision measurements in digital images. The research summarized in the report resulted in 5 Ph.D. Theses, 5 M.S.E.E. theses, and over 20 additional publications.
Author (GRA)

N86-14508# Rockwell International Corp., Thousand Oaks, Calif. Microelectronics Research and Development Center.
IN SITU SELECTED AREA DOPING OF GaAs BY MOLECULAR BEAM EPITAXY Final Report, 1 Jun. 1983 - 31 May 1985

D. L. Miller and S. P. Kowalczyk Jul. 1985 68 p
(Contract DAAG29-83-C-0019)
(AD-A158516; MRDC41135.4FR; ARO-19492.3-PH) Avail: NTIS HC A04/MF A01 CSCL 20/12

This final report contains a description of the technical progress for the final six month period of this program and a summary of the most important previous results of this program. In this final period a new in situ selected area doping process was investigated which appears to be the most promising of the three evaluated in this program. During an investigation of UV photolytic deposition of tin from organotin compounds, it was found that during the initial stages of deposition with halogenated tin compounds, etching of the semiconductor surface occurs affecting the surface stoichiometry. This result has important implications for application of UV photolytic deposition of metals on semiconductors as well as photochemical etch processing. Initial experiments involving in situ photochemical etching of GaAs MBE substrates was carried out. Author (GRA)

N86-14509# Massachusetts Inst. of Tech., Cambridge. Dept. of Electrical Engineering and Computer Science.
A COHERENT VLSI DESIGN ENVIRONMENT Semiannual Technical Report, 1 Oct. 1984 - 31 Mar. 1985
P. Penfield, Jr., L. A. Glasser, T. F. Knight, Jr., C. E. Leiserson, and R. L. Rivest 31 Mar. 1985 89 p
(Contract N00014-80-C-0622)
(AD-A158540) Avail: NTIS HC A05/MF A01 CSCL 09/5

This report covers the period from October 1, 1984 through March 31, 1985. The research discussed here is described in more detail in several published and unpublished reports cited below. Several fundamental bounds on the complexity of network architecture, parallel computation, VLSI design, and algorithms have been established and/or improved during this period. The grid-matching problem, of importance to wafer-scale integration, is close to solution, Improved algorithms for two-layer channel routing have been developed. The fat-tree interconnection network has been studied further, and a better algorithm for on-line routing of messages in this network has been developed. There is continued interest in compaction, and a provably fast algorithm for solving constraint systems has been devised. The CAD frame Schema has been solidified in several ways during this period. It is now possible to use Schema as a schematic capture and data storage system, There is better support being developed for PC-board designs. Some advanced ideas in describing waveforms qualitatively are being incorporated. A novel PROM device that is UV-enabled for writing has been designed and tested. The tradeoff between speed and fault probability in A/D converters has been viewed from a new angle. GRA

N86-14510# Naval Air Test Center, Patuxent River, Md.
APPLICATION OF NOMOGRAPHS FOR ANALYSIS AND PREDICTION OF RECEIVER SPURIOUS RESPONSE EMI
F. W. Heather 23 Jul. 1985 15 p
(AD-A158652; NATC-TM-85-58-SY) Avail: NTIS HC A02/MF A01 CSCL 20/14

Spurious response EMI for the front end of a superheterodyne receiver follows a simple mathematic formula; however, the application of the formula to predict test frequencies produces more data than can be evaluated. An analysis technique has been developed to graphically depict all receiver spurious responses usig a nomograph and to permit selection of optimum test frequencies. The discussion includes the math model used to simulate a superheterodyne receiver, the implementation of the model in the computer program, the approach to test frequency selection, interpretation of the nomographs, analysis and prediction of receiver spurious response EMI from the nomographs, and application of the nomographs. In addition, figures are provided of sample applications. This EMI analysis and prediction technique greatly improves the Electromagnetic Compatibility (EMC) test engineer's ability to visualize the scope of receiver spurious response EMI testing and optimize test frequency selection. GRA

N86-14511# Naval Surface Weapons Center, Silver Spring, Md.
EMITTANCE MEASUREMENTS OF SPACE CHARGE DOMINATED ELECTRON BEAM Final Report
W. Namkung and E. P. Chojnacki 1 Jun. 1985 31 p
(AD-A158693; NSWC/TR-85-244) Avail: NTIS HC A03/MF A01 CSCL 20/7

A diagnostic technique of the beam emittance is developed for electron beams with diverging envelopes under strong space charge forces. Radial profiles of current density, local temperature, and divergence angle are measured by the slit-pinhole method for axisymmetric beams. The partical distribution function in transverse phase space is then constructed and the rms emittance is obtained by numerical integrations. A 5 kV, 200 mA, and 3 microsec electron beam is used in the comparison between theory and experiment on this diagnostic method. Author (GRA)

N86-14512# Washington Univ., Seattle. Dept. of Computer Science.
VLSI (VERY LARGE SCALE INTEGRATION) DESIGN TOOLS, REFERENCE MANUAL, RELEASE 3.0 Interim Report
Aug. 1985 431 p
(Contract MDA903-85-K-0072)
(AD-A158699; TR-85-07-03) Avail: NTIS HC A19/MF A01 CSCL 09/5

This report describes the use of the University of Washington/ Northwest VLSI Consortium's package of VLSI design tools. The tools described are: functional design tools; layout tools; display tools; rule checkers; circuit extractor; simulation tools; and utilites/miscellaneous. GRA

N86-14513# Smith, Hinchman and Gryllis Associates, Inc., Detroit, Mich.
LIGHTING CONTROL SYSTEMS HANDBOOK Final Report, Oct. 1979 - Mar. 1985
E. Rappaport Jun. 1985 178 p
(Contract N68305-9213-7980)
(AD-A158700; NCEL-CR-85.010) Avail: NTIS HC A09/MF A01 CSCL 13/1

The functional components of a lighting control system are described using a modular approach. The interaction of the components and the specific kind of hardware available for each function are detailed. The components are then combined into various control systems beginning with simple manual control and concluding with closed loop automatic control. Emphasis is placed on energy and economics. GRA

N86-14514# Army Test and Evaluation Command, Aberdeen Proving Ground, Md.
COLD REGIONS LOGISTIC SUPPORTABILITY TESTING OF ELECTRONIC, AVIONIC AND COMMUNICATIONS EQUIPMENT Final Report, on Test Operations Procedure
20 Jun. 1985 28 p
(AD-A158887; TOP-6-4-007) Avail: NTIS HC A03/MF A01 CSCL 15/5

This document describes methods and techniques necessary to perform a logistic supportability test of electronic, avionic, and communications equipment in a cold regions environment. GRA

N86-14515# University Coll., Cork (Ireland). Microelectronics Research Center.
LOW CAPACITANCE e-BEAM FABRICATED BEAM LEAD SCHOTTKY BARRIER DIODES Final Technical Report, Mar. 1981 - Jan. 1985
G. T. Wrixon Jun. 1985 41 p
(Contract DAJA37-81-C-0261; DA Proj. 1T1-61102-BH-57)
(AD-A159494) Avail: NTIS HC A03/MF A01 CSCL 09/1

This is the final report in the series describing the work performed under contract No. DAJA37-81-C-0261, the object of which is to develop a process capable of fabricating low-parasitic high performance beam diodes. The diode chips use a unique physical structure which maximizes overall strength and minimizes the structural capacitance. In this report we present the full process

which has been developed and we describe the evaluation devices which have been produced. GRA

N86-14516# Aerospace Corp., El Segundo, Calif. Chemistry and Physics Lab.
A NEW CORRECTION TO SCHOTTKY BARRIER LOWERING IN CATHODES
G. Eng 15 Jul. 1985 51 p
(Contract F04701-83-C-0084)
(AD-A159500; TR-0084A(5945-02)-1; SD-TR-85-42) Avail: NTIS HC A04/MF A01 CSCL 09/1

Understanding cathode behavior is one of the most crucial areas confronting manufacturers of travelling wave tube (TWT) amplifiers. The need for long lifetime, high emission current, and high reliability for potential space applications means that more stringent testing and evaluation procedures are needed to help select suitable devices. Here we address one such crucial area, that of the expected cathode emission current. The net emission current under given specific conditions is the single most used criterion for evaluating cathode performance. Until recently, full understanding of the cathode I-V and I-T characteristics for even a uniform work function surface was not yet developed. Expressions were known in the limit of low applied voltage or high temperature, and in the limit of high applied voltage or low operating temperature. A full solution to the uniform work planar diode requires both the effects of space-charge and Schottky barrier-lowering to be included, if one is to cover the entire spectrum from space-charge limited (SCL) to temperature-limited (TL) emission. GRA

N86-14517# California Univ., Berkeley. Lawrence Berkeley Lab.
LIFE OF FLUORESCENT LAMPS OPERATED AT HIGH FREQUENCIES WITH SOLID-STATE BALLASTS
R. R. Verderber, O. Morse, and F. M. Rubinstein Jul. 1985 7 p Presented at the IEEE-Industrial Applications Society Annual Meeting, Toronto, Ontario, 6 Oct. 1985
(Contract DE-AC03-76SF-00098)
(DE85-017647; LBL-19778; CONF-851071-4; EEB-L-85-06) Avail: NTIS HC A02/MF A01

Standard 40-watt, F-40, rapid-start, fluorescent lamps were operated with solid-state ballasts following the standard life-testing cycle of 3 hours on and 20 minutes off for more than 20,000 hours at high frequency. Lamp operating characteristics (starting voltage, filament voltage, arc current, and current-crest factor) were studied as factors affecting lamp life. Measurements show that fluorescent lamps can attain rated life at high frequency using solid-state ballasts. When lamps are operated in the dimmed mode, full filament power is required to sustain lamplife. The rate of lamp lumen depreciation is dependent on the lamp loading and not the operating frequency. DOE

N86-14518# California Univ., Berkeley. Lawrence Berkeley Lab.
EFFECT OF FILAMENT POWER REMOVAL ON A FLUORESCENT LAMP SYSTEM
R. R. Verderber, O. Morse, and F. M. Rubinstein Jul. 1985 7 p Presented at the IEEE-Industrial Application Society's Annual Meeting, Toronto, Ontario, 6 Oct. 1985
(Contract DE-AC03-76SF-00098)
(DE85-017648; LBL-19779; CONF-851071-3; EEB-L-85-05) Avail: NTIS HC A02/MF A01

Two techniques are used to measure the effects of removing the filament power from a two-lamp, F-40, rapid-start fluorescent lamp system. The changes are measured for a standard CBM core-coil ballast and for a solid-state ballast operating the lamp at high frequency. There is a 4 tp 6% increase in system efficacy when the filament power is removed. Removal of filament power also decreases filament temperature from 1000C to below 700C in lamps operated at 60 Hz, and from above 600C to 300C in lamps operated at high frequency. The study shows that the arc current and anode fall also determine filament temperature. DOE

N86-14519# Oak Ridge National Lab., Tenn.
HYDROGEN ARC DISCHARGE CLEANING OF ACCELERATOR TUBES
P. H. Stelson, J. R. Raatz, and R. D. Rathmell 1985 6 p refs Presented at the 4th International Conference on Electrostatic Accelerator Technology and Associate Boosters, Buenos Aires, 15 Apr. 1985 Prepared in cooperation with National Electrostatic Corp., Middleton, Wisc.
(Contract DE-AC05-84OR-21400)
(DE85-016393; CONF-850470-10) Avail: NTIS HC A02/MF A01

Accelerator tubes manufactured by NEC were cleaned by the hydrogen arc discharge method and tested on the NEC 3-MV test accelerator. We will discuss the results of this testing program. Generally, we confirm the favorable experience previously obtained by Korschinek, et al. The familiar microdischarge exhibited by normal tubes are largely elminated in arc duscharge cleaned tubes. Thus, the arc discharge process has the same observable effect as voltage conditioning. This result suggests that the hydrogen discharge is effective in removing carbon and hydrocarbons from the surface of the accelerator tube. DOE

N86-14520# Allied Bendix Aerospace, Kansas City, Mo.
PRINTED WIRING BOARD PROCESS IMPROVEMENT Final Report
M. E. Evans and F. L. Gentry Jul. 1985 30 p
(Contract DE-AC04-76DP-00613)
(DE85-015422; BDX-613-3173) Avail: NTIS HC A03/MF A01

This project investigated ways of improving printed wiring board (PWB) fabrication at BKCD. The primary objective of the mechaning portion was to determine the best manufacturing techniques for rigid double-sided and multilayer printed wiring products, and to identify the process changes required to implement those techniques. Another objective was to improve solder thickness and shelf life by using the hot air leveling process. All process variables were identified and a suitable manufacturing process was established. Copper plating of PWBs presently used a solution of copper pyrophosphate that has several disadvantages. The properties of the copper deposit from an acid copper sulfate process and relative ease of chemical control offer advantages over the pyrophosphate process and are being evaluated for use. DOE

N86-14521# Centre Technique des Industries Mecaniques, Senlis (France).
DEFINITION OF A COMPUTER PROGRAM TO ESTIMATE THE IMPEDANCE OF AN EDDY CURRENT TRANSDUCER Final Report [DEFINITION D'UN LOGICIEL ADAPTE AU CALCUL DE L'IMPEDANCE D'UN CAPTEUR A COURANTS DE FOUCAULT]
G. Wache, J. Lasnier, M. Mansir, N. Burais, and A. Nicolas 21 Feb. 1985 115 p refs In FRENCH
(CETIM-100-880) Avail: NTIS HC A06/MF A01

The behavior of eddy current transducers used to detect defects in industrial quality control is studied and the computer programs representing the linear and nonlinear models are described. The programs describe the transducer impedance variation as a consequence of local modifications in the material and in the magnetic flow. Two types of transducer were tested to verify the programs. Differences between computation and measurement are discussed. Author (ESA)

N86-14522# Centre Technique des Industries Mecaniques, Nantes (France).
STUDY OF GRAPHITE ELECTRODE ARC GOUGING WITH A COMPRESSED AIR JET Final Report [ETUDE DU GOUGEAGE A L'ARC A L'ELECTRODE DE GRAPHITE AVEC JET D'AIR COMPRIME]
Gaillard (Institut de Soudre) and J. Cabanne (Institut de Soudre) 16 Nov. 1984 51 p refs In FRENCH
(Contract DGRST-83-1756)
(CETIM-101-000; IS-15-579) Avail: NTIS HC A04/MF A01

Gouging and cutting using a graphite arc was surveyed. Potential problems of carburizing, tempering, and copper deposits are examined. Experiments were performed on low alloy steels and austenitic steels. It is shown that there is no risk if certain precautions are taken. Only the work done at interior angles of <

30 deg requires additional cleaning procedures before welding.
Author (ESA)

N86-14523# Centre Technique des Industries Mecaniques, Senlis (France).
ANALYSES OF SEMICONDUCTOR RADIATION DETECTORS THAT COULD BE USED IN A GAMMA DOSIMETER Final Report [ANALYSE DE DETECTEURS DE RAYONNEMENT A SEMI-CONDUCTEUR POUVANT SERVIR A LA REALISATION D'UN POSEMETRE GAMMA]
G. Peix (Institut National des Sciences Appliquees, Toulouse), S. Valenzuela Garcia (Institut National des Sciences Appliquees, Toulouse), and Rivenez Dec. 1984 72 p In FRENCH
(CETIM-102-020) Avail: NTIS HC A04/MF A01

Radiation counters were tested in experiments combining steel thickness, lead filter thickness, radiation source, and radiographic film to develop an indicator of exposure time. A prototype was built to use in combination with an Iridium 192 source. A geiger counter is used as detector, but the possibility to utilize CdTe semiconductor detectors is discussed. The applications and characteristics of the device are detailed. Author (ESA)

N86-14524# Telefunken Electronic G.m.b.H., Heilbronn (West Germany).
BASIC TECHNOLOGIES FOR THE FABRICATION OF GaAs MONOLITHIC INTEGRATED CIRCUITS Final Report, Aug. 1984
Alexander Colquhoun, Werner Mroczek, and Jochen Gerner Bonn Bundesministerium fuer Forschung und Technologie Apr. 1985 92 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-85-038; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 19.50

Organometal epitaxy and implantation technologies for the fabrication of GaAs monolithic integrated circuits were developed. The MOCVD epitaxy process was examined and device-oriented procedures for the growth of thin high quality epitaxial layers were produced. Processing techniques for the fabrication of GaAs-MESFET devices were derived and single and dual gate transistors were fabricated. A dual gate FET with a gain-band width product of 6.5 GHz and 1.1 dB minimum noise figure at 0.8 GHz was fabricated. To test the technology, an integrated broadband amplifier was designed and constructed. The amplifier has a gain-bandwidth product of 1.35 GHz and a minimum noise figure of 3 dB at 1 GHz. Author (ESA)

N86-14525# Nationaal Inst. voor Kernfysica en Hoge Energiefysica, Amsterdam (Netherlands). Sectie-K.
SEPARATE GATE ANALOG TO DIGITAL CONVERTER (ADC) CONTROL [SEPARATE GATE A.D.C. AANSTURING]
J. D. Schipper 22 Mar. 1985 24 p In DUTCH
(DIGEL-53) Avail: NTIS HC A02/MF A01

A module providing the control signals for up to three connected separate gate Analog to Digital Converters (ADC) to avoid unnecessary ADC conversions was developed. A time window is set by the enable signal for the module. An event to be registered within this window is stated to the module by the gate pulse. If one of the channel inputs gets a signal, after an adjusted delay, the relevant ADC input gate is opened during an adjusted interval. Each enabled signal permits only one gate pulse. Author (ESA)

N86-14526# Nationaal Inst. voor Kernfysica en Hoge Energiefysica, Amsterdam (Netherlands). Sectie-K.
TRAVELING WAVE MONITOR PHASE DISCRIMINATOR [TRAVELING WAVE MONITOR FASE DISCRIMINATOR]
K. Oostveen Mar. 1985 20 p In DUTCH
(DIGEL-62) Avail: NTIS HC A02/MF A01

Traveling wave monitor (TWM) detection electronics were developed and tested. Four 10 MHz signals (2 Y-signals and 2 X-signals) are produced by the TWM. The X and Y positions are obtained by the phase differences between the X and Y-signals. The discriminator consists of two phase-detector prints and a print for squelch and gating. Tests show good results; the built-in automatic noise reduction provides a noise-free image even at very low bunch currents. Author (ESA)

N86-14527# Nationaal Inst. voor Kernfysica en Hoge Energiefysica, Amsterdam (Netherlands). Sectie-K.
BODY CURRENT METER 820811 [BODYCURRENT-METER 820811]
J. T. vanEs Apr. 1985 10 p In DUTCH
(DIGEL-63) Avail: NTIS HC A02/MF A01

A module to control the klystron body current caused by badly focused electrons is presented. A sample and hold circuit with timers started by the current impulse frontside and selecting a time interval was developed. An upper limit adjustment with comparator, giving the alarm signal is carried out. Current and adjusted value are indicated. Automatic and external alarm resets are present. The apparatus is provided with recorder and monitor output to register and observe the current inputs. The measuring shunt, a 1 ohm resistance, is attached to the klystron body.
Author (ESA)

N86-14528# Technische Hogeschool, Delft (Netherlands). Lab. voor Elektronische Instrumentatie.
THE STEPPING MOTOR [DE STAPPENMOTOR]
R. Moerman Jun. 1984 90 p refs In DUTCH
(Rept-051.547.E.I.2-47) Avail: NTIS HC A05/MF A01

Stepping motor types and step patterns were surveyed. Logic circuits used to drive the motors are considered. Author (ESA)

N86-14426# Yamaguchi Univ., Ube (Japan).
AN EXPERIMENTAL INVESTIGATION OF FREE CONVECTION COOLING OF ELECTRONIC EQUIPMENT
Masahide Miyamoto, Yasuo Katoh, and Masaichi Sakata *In its* Memoirs of the Faculty of Engineering, Yamaguchi University, Vol. 36, No. 1 Oct. 1985 p 51-59 refs In JAPANESE; ENGLISH summary (For primary document see N86-14418 05-31)
(Rept-3) Avail: NTIS HC A09/MF A01

N86-14427# Yamaguchi Univ., Ube (Japan).
A NUMERICAL STUDY OF FREE CONVECTION COOLING OF ELECTRONIC EQUIPMENT
Masahide Miyamoto, Yasuo Katoh, and Masaichi Sakata *In its* Memoirs of the Faculty of Engineering, Yamaguchi University, Vol. 36, No. 1 Oct. 1985 p 61-68 refs In JAPANESE; ENGLISH summary (For primary document see N86-14418 05-31)
(Rept-4) Avail: NTIS HC A09/MF A01

N86-14435# Joint Publications Research Service, Arlington, Va.
THE 11 GHz STABLE GaAs-FET OSCILLATOR DESCRIBED
Xi Tianmin *In its* China Report: Science and Technology (JRPS-CST-85-027) 22 Aug. 1985 p 106-114 Transl. into ENGLISH from Dianzi Jishu Yingyong (Beijing), no. 1, 25 Jan. 1985 p 27-30 (For primary document see N86-14433 05-31)
Avail: NTIS HC A09/MF A01

N86-14463*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A VLSI SINGLE CHIP 8-BIT FINITE FIELD MULTIPLIER
I. S. Hsu, L. J. Deutsch, T. K. Truong, and H. M. Shao *In its* The Telecommunications and Data Acquisition Report 15 Nov. 1985 p 45-50 refs (For primary document see N86-14457 05-32)
Avail: NTIS HC A10/MF A01 CSCL 09A

N86-14464*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A VLSI SINGLE CHIP (255,223) REED-SOLOMON ENCODER
I. S. Hsu, L. J. Deutsch, T. K. Truong, and I. S. Reed (Univ. of Southern California) *In its* The Telecommunications and Data Acquisition Report 15 Nov. 1985 p 51-56 refs (For primary document see N86-14457 05-32)
Avail: NTIS HC A10/MF A01 CSCL 09A

N86-14465*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

CARRIER TRACKING BY SMOOTHING FILTER CAN IMPROVE SYMBOL SNR
C. A. Pomalaza-Raez and W. J. Hurd *In its* The Telecommunications and Data Acquisition Report 15 Nov. 1985 p 57-62 refs (For primary document see N86-14457 05-32)
Avail: NTIS HC A10/MF A01 CSCL 09C

N86-14466*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A CLASS OF OPTIMUM DIGITAL PHASE LOCKED LOOPS FOR THE DSN ADVANCED RECEIVER
R. Kumar and W. J. Hurd *In its* The Telecommunications and Data Acquisition Report 15 Nov. 1985 p 63-80 refs (For primary document see N86-14457 05-32)
Avail: NTIS HC A10/MF A01 CSCL 09A

N86-14467*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A LASER PLOTTING SYSTEM FOR VLSI CHIP LAYOUTS
J. A. Harding and L. J. Deutsch *In its* The Telecommunications and Data Acquisition Report 15 Nov. 1985 p 81-91 refs (For primary document see N86-14457 05-32)
Avail: NTIS HC A10/MF A01 CSCL 09C

N86-14471*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A GENERAL MONITOR AND CONTROL INTERFACE TO THE VAX UNIBUS BY WAY OF THE DR11-C I/O PORT
S. S. Brokl *In its* The Telecommunications and Data Acquisition Report 15 Nov. 1985 p 125-133 ref (For primary document see N86-14457 05-32)
Avail: NTIS HC A10/MF A01 CSCL 09C

N86-14908# Ballistic Research Labs., Aberdeen Proving Ground, Md.
CODE ITERATION FOR NOISY CHANNELS
A. B. Cooper, III *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 75-84 (For primary document see N86-14902 05-59)
(AD-P004907) Avail: NTIS HC A99/MF E03 CSCL 09/4

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N86-14529# Toronto Univ. (Ontario). Inst. for Aerospace Studies.
EFFECTS OF PARTICLE VOLUME ON THE STRUCTURE OF A PARTLY DISPERSED NORMAL SHOCK WAVE IN A DUSTY GAS
J. J. Gottlieb and C. E. Coskunses Oct. 1985 108 p refs Sponsored in part by Defence Research Establishment Suffield, Ralston, Alberta and Natural Sciences and Engineering Council of Canada
(UTIAS-295; ISSN-0082-5255) Avail: NTIS HC A06/MF A01

The structure of a partly dispersed shock wave in a steady, one-dimensional flow of a dusty gas is studied in depth, including the frozen flow just behind the leading gas shocks, nonequilibrium flow in the relaxation zone, and final equilibrium flow. Particle volume effects, which are normally important only if the particles are numerous and/or have a low density, are included more fully in the present analysis than in previous studies. As an example, the effects of virtual mass of the particles is included and assessed for the first time. Including the effects of particle volume more completely has yielded a new equation for the frozen sound speed, a better definition of the frozen shock Mach number, and a more accurate dividing line between fully and partly dispersed shock waves in dusty gases. Also, simpler and more elegant expressions have been obtained for the equilibrium-flow properties, in a more classic form as modified Rankine-Hugoniot equations. B.W.

N86-14530*# National Aeronautics and Space Administration. Johnson (Lyndon B.) Space Center,
SLIP-BOUNDARY EQUATIONS FOR MULTICOMPONENT NON-EQUILIBRIUM AIRFLOW
Roop N. Gupta, Carl D. Scott, and James N. Moss Nov. 1985 58 p refs
(NASA-TP-2452; L-15952; NAS 1.60:2452) Avail: NTIS HC A04/MF A01 CSCL 20D

Equations are presented for the surface-slip (or jump) values of species concentration, pressure, velocity, and temperature in the low Reynolds number, high-altitude flight regime of a space vehicle. These are obtained from closed-form solutions of the mass, momentum, and energy flux equations by using the Chapman-Enskog velocity distribution function. This function represents a solution of the Boltzmann equation in the Navier-Stokes approximation. The analysis, obtained for nonequilibrium multicomponent airflow, includes the finite-rare surface catalytic recombination and changes in the internal energy during reflection from the surface. Expressions for the various slip quantities have been obtained in a form which can readily be employed in flow-field computations. A consistent set of equations is provided for multicomponent and binary mixtures and single-species gas. An expression is also provided for the finite-rate species-concentration boundary condition for a multicomponent mixture in the absence of slip. Author

N86-14531*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
EVOLUTION OF A CURVED VORTEX FILAMENT INTO A VORTEX RING
Parviz Moin, Anthony Leonard, and John Kim Nov. 1985 26 p refs
(NASA-TM-86831; Rept-85399; NAS 1.15:86831) Avail: NTIS HC A03/MF A01 CSCL 20D

The deformation of a hairpin-shaped vortex filament under self-induction and in the presence of shear is studied numerically using the Biot-Savart law. It is shown that the tip region of an elongated hairpin vortex evolves into a vortex ring and that the presence of mean shear impedes the process. Evolution of a finite-thickness vortex sheet under self-induction is also investigated using the Navier-Stokes equations. The layer evolves into a hairpin vortex which in turn produces a vortex ring of high Reynolds stress content. These results indicate a mechanism for the generation of ring vortices in turbulent shear flows, and a link between the experimental and numerical observation of hairpin vortices and the observation of ring vortices in the outer regions of turbulent boundary layers. Author

N86-14532*# Old Dominion Univ., Norfolk, Va. Dept. of Mechanical Engineering and Mechanics.
INVESTIGATION OF CHEMICALLY-REACTING SUPERSONIC INTERNAL FLOWS Progress Report
T. Chitsomboon and S. N. Tiwari Sep. 1985 45 p refs
(Grant NAG1-423)
(NASA-CR-176363; NAS 1.26:176363) Avail: NTIS HC A03/MF A01 CSCL 20D

This report covers work done on the research project Analysis and Computation of Internal Flow Field in a Scramjet Engine. The work is supported by the NASA Langley Research Center (Computational Methods Branch of the High-Speed Aerodynamics Division) through research grant NAG1-423. The governing equations of two-dimensional chemically-reacting flows are presented together with the global two-step chemistry model. The finite-difference algorithm used is illustrated and the method of circumventing the stiffness is discussed. The computer program developed is used to solve two model problems of a premixed chemically-reacting flow. The results obtained are physically reasonable. Author

N86-14533# Battelle Columbus Labs., Ohio.
THIN FILM CONDUCTIVE COATINGS FOR SURFACE HEATING

AND DECONTAMINATION Contractor Report, Jul. - Nov. 1984
S. S. Sadhal and P. S. Ayyaswamy Jun. 1985 64 p Prepared in cooperation with Univ. of Southern California, Los Angeles
(Contract DAAG29-81-D-0100)
(AD-A158687; CRDC-CR-85028) Avail: NTIS HC A04/MF A01 CSCL 07/4

In the present analysis we examine the process of decontamination by heating the plexiglass substrates with imbedded electrically conducting layers. The application of such heating elements for the purpose of deicing is well known. However, little is known about its overall effectiveness for the removal of adsorbed and absorbed contaminants. While the heat input supplies energy to the contaminant molecules and sets them into a free state (gaseous state), it also increases the solubility of the contaminant in the solid substrate. It is therefore necessary to carry out a detailed mathematical analysis to determine the effect of heating on adsorbed and absorbed contaminants. In the current development we first present and overview of adsorption/desorption kinetics and then develop a one-dimensional model for the removal of physically adsorbed contaminants. The mathematical analysis provides information as to what data are needed to predict the performance of such a decontamination system. At the same time some typical cases have been run to simulate such prediction. Also included are cases for which the increased solubility due to heating may cause the contaminant level to increase. GRA

N86-14534# Naval Postgraduate School, Monterey, Calif.
THE EFFECT OF CONDENSATE INUNDATION ON STEAM CONDENSATION HEAT TRANSFER IN A TUBE BUNDLE M.S. Thesis
S. K. Brower Jun. 1985 105 p
(AD-A158895) Avail: NTIS HC A06/MF A01 CSCL 20/13

Steam-condensation heat-transfer measurements were made using a 5-tube in-line test condenser with an additional perforated tube to simulate up to 30 active tubes. Results were obtained for smooth tubes wire-wrapped tubes and dropwise-coated tubes. The average outside heat-transfer coefficient for 30 smooth tubes was 0.64 times the Nusselt coefficient fo the first tube. A total of eight wire-diameter and wire-pitch combinations were tested: 1.6-mm-diameter wire wrapped at 16 mm, 7.6 mm and 4 mm wire pitches, 1.0-mm-diameter wire wrapped at 8 mm, 4 mm and 2 mm wire pitches, and 0.5-mm-diameter wire wrapped at 4 and 2 mm wire pitches. The best bundle performance was obtained when the tubes were wrapped with 1.0-mm-diameter wire at a wire pitch of 4 mm. This combination resulted in an average outside heat-transfer coefficient for 30 tubes that was 1.15 times the value computed for the first time using the Nusselt theory. The average outside heat-transfer coefficient for 30 dropwise-coated tubes was 1.1 times the value of the heat-transfer coefficient for the first tube in the tube bundle. Using either wire-wrapped tubes or dropwise-coated tubes, it is possible to significantly reduce the condenser surface area and overall size. GRA

N86-14535# Naval Ship Research and Development Center, Bethesda, Md. Ship Performance Dept.
AN ITERATIVE SOLUTION PROCEDURE FOR CALCULATING POTENTIAL FLOW
Y. T. Lee and F. Noblesse Sep. 1985 19 p
(NR Proj. ZR0-2301)
(AD-A159207; DTNSRDC/SPD-1155-01) Avail: NTIS HC A02/MF A01 CSCL 20/4

The report presents the results of a numerical investigation of a novel recurrence relation for iteratively solving modified integral equations for calculating free-surface potential flow. Numerical results are presented for the simple case of wave radiation in the zero- and infinite-frequency limits. GRA

N86-14536# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
MACH STEM MODELING WITH SPHERICAL SHOCK WAVES M.S. Thesis
W. E. Eichinger Mar. 1985 105 p
(AD-A159214; AFIT/GNE/ENP/85M-6) Avail: NTIS HC A06/MF A01 CSCL 18/3

A semiempirical model was developed for the treatment of the Mach stem region of a nuclear airburst. This model predicts the conditions that would be observed by an aircraft or missile as well as the limits of this region in space. The model is based upon current shock theory. Where three shock theory fails to accurately predict physical reality, new relations are developed or empirical data is used. Specifically, this model predicts the path of the triple point, the overpressure, dynamic pressure, time of arrival, and direction of the shock impulse above the ground. An explanation of the development of each prediction is made and compared to actual nuclear or high explosive test data. Additionally, a comparison is made between conventional Mach stem modeling and this model. Unique to this model is a method for predicting the variation of pressure with altitude above the ground. For low scaled heights of burst, the overpressure found at an altitude of 20% of the triple point height is greater than that on the ground. In addition, the overpressure measured just below the triple points if found to be only 60% of the ground overpressure scaled to altitude. This prediction is radically different than conventional ground overpressures scaled to atmospheric pressure at altitude. The predictions made by this model are verified by nuclear and high explosive test data. GRA

N86-14537# California Inst. of Tech., Pasadena.
CAVITATION INCEPTION Final Report, 1 Oct. 1974 - 30 Sep. 1984
A. J. Acosta 31 Mar. 1985 31 p
(Contract N00014-75-C-0378)
(AD-A159297; AD-F250300) Avail: NTIS HC A03/MF A01 CSCL 20/4

The prediction of cavitation inception in the laboratory is an important aspect of design development and operation of fluid dynamic devices for naval hydrodynamic applications. This report briefly summarizes ten years of laboratory research on cavitation inception in flows past smooth bodies and flows with separation. The instrumentation that has been developed to study these flows is described briefly together with means of counting the concentration of the cavitation nuclei known to be important for inception to occur. GRA

N86-14538# Pennsylvania State Univ., University Park. Applied Research Lab.
NUMERICAL APPROXIMATION OF THE TOTAL DRAG OF A BODY IN A TUBE
K. C. Kaufman 25 Jun. 1985 43 p
(Contract N00024-79-C-6043)
(AD-A159548; ARL/PSU/TM-85-108) Avail: NTIS HC A03/MF A01 CSCL 20/4

A study is made of numerical methods to approximate the total drag coefficient of an axisymmetric body in a tube. An analytical relationship for the drag coefficient is obtained via a standard open system control volume analysis. This relationship is found to be difficult to apply numerically using available numerical tools, leading to an approximation of the drag coefficient by neglecting the tube wall skin friction and the pressure distribution across the tube radius near the body tail. The resulting drag coefficient approximation, which accounts for tunnel blockage and horizontal buoyancy effects, is found to provide a good estimate to available experimental data for an unheated body. The approximation makes use of currently available numerical codes for axisymmetric inviscid and boundary layer flow. Numerical obtained drag distributions over a range of Reynolds numbers are compared with experimental drag data for the unheated laminar flow body in the Garfield Thomas 48-inch diameter water tunnel. Author (GRA)

N86-14539# Argonne National Lab., Ill.
NUMERICAL SIMULATION OF HEAT EXCHANGER
W. T. Sha 1985 18 p Presented at the United States-Japan Heat Transfer joint Seminar, San Diego, California, 17 Sep. 1985
(Contract W-31-109-eng-38)
(DE85-015002; CONF-8509122-1) Avail: NTIS HC A02/MF A01

Accurate and detailed knowledge of the fluid flow field and thermal distribution inside a heat exchanger becomes invaluable as a large, efficient, and reliable unit is sought. This information is needed to provide proper evaluation of the thermal and structural performance characteristics of a heat exchanger. It is to be noted that an analytical prediction method, when properly validated, will greatly reduce the need for model testing, facilitate interpolating and extrapolating test data, aid in optimizing heat-exchanger design and performance, and provide scaling capability. Thus tremendous savings of cost and time are realized. With the advent of large digital computers and advances in the development of computational fluid mechanics, it has become possible to predict analytically, through numerical solution, the conservation equations of mass, momentum, and energy for both the shellside and tubeside fluids. The numerical modeling technique will be a valuable, cost-effective design tool for development of advanced heat exchangers. DOE

N86-14540# Lawrence Livermore National Lab., Calif.
MOLECULAR DYNAMICS SIMULATIONS
B. J. Alder Jul. 1985 29 p refs Presented at the International School of Physics on Molecular Dynamics Simulation of Statistical Mechanical Systems, Varenna, Lake Como, Italy, 23 Jul. 1985
(Contract W-7405-eng-48)
(DE85-015541; UCRL-92971; CONF-850764-3) Avail: NTIS HC A03/MF A01

The molecular dynamics computer simulation discovery of the slow decay of the velocity autocorrelation function in fluids is briefly reviewed in order to contrast that long time tail with those observed for the stress autocorrelation function in fluids and the velocity autocorrelation function in the Lorentz gas. For a non-localized particle in the Lorentz gas it is made plausible that even if it behaved quantum mechanically its long time tail would be the same as the classical one. The generalization of Fick's law for diffusion for the Lorentz gas, necessary to avoid divergences due to the slow decay of correlations, is presented. For fluids, that generalization has not yet been established, but the region of validity of generalized hydrodynamics is discussed. DOE

N86-14541# Pennsylvania State Univ., University Park. Dept. of Mechanical Engineering.
MANUAL FOR THE THERMAL AND HDYRAULIC DESIGN OF DIRECT CONTRACT SPRAY COLUMNS FOR USE IN EXTRACTING HEAT FROM GEOTHERMAL BRINES
H. R. Jacobs Jun. 1985 47 p refs
(Contract DE-AS07-76ID-01533)
(DE85-015358; DOE/ID-01523/T2) Avail: NTIS HC A03/MF A01

This report outlines the current methods being used in the thermal and hydraulic design of spray column type, direct contact heat exchangers. It provides appropriate referenced equations for both preliminary design and detailed performance. The design methods are primarily empirical and are applicable for use in the design of such units for geothermal application and for application with solar ponds. Methods for design, for both preheater and boiler sections of the primary heat exchangers, for direct contact binary powers plants are included. DOE

N86-14542# New York Univ., New York. Mathematics and Computing Lab.
COMPUTATIONAL MODEL FOR INTERFACES
J. Glimm and O. A. McBryan Jun. 1985 23 p refs
(Contract DE-AC02-76ER-03077)
(DE85-016186; DOE/ER-03077/265) Avail: NTIS HC A02/MF A01

Decompositions of the plane into disjoint components separated by curves occur frequently. We describe a package of subroutines which provides facilities for defining, building and modifying such decompositions and for efficiently solving various point and area location problems. Beyond the point that the specification of this package may be useful to others, we reach the broader conclusion that well designed data structures and support routines allow the use of more conceptual or nonnumerical portions of mathematics in the computational process, thereby extending greatly the potential scope of the use of computers in scientific problem solving. Ideas from conceptual mathematics, symbolic computation and computer science can be utilized within the framework of scientific computing and have an important role to play in that area. DOE

N86-14543# New York Univ., New York. Mathematics and Computing Lab.
APPLICATION OF FRONT TRACKING TO TWO DIMENSIONAL CURVED DETONATION FRONTS
B. Bukiet Jun. 1985 26 p refs
(Contract DE-AC02-76ER-03077)
(DE85-016183; DOE/ER-03077/261) Avail: NTIS HC A03/MF A01

The method of front tracking is applied to cylindrically symmetric detonations. This two dimensional method is compared to a one dimensional random choice computation in the radial direction which explicitly utilizes the symmetry of the problem. The model of detonations is the Chapman-Jouguet thin flame model. The random choice computation gives a solution of high accuracy of these model equations and is thus taken as exact. We present results demonstrating the high quality of the front tracking solution, even on coarse grids. The solution at the front and in the interior converges linearly to the exact solution. The computation in the interior used a second order method (Lax-Wendroff) and the linear convergence appears to result from the fact that the solution in the interior (i.e., excluding discontinuities) is C(1) but not C(2). This is due to corners in the solution, located at the edges of a rarefaction wave. DOE

N86-14544# Sandia National Labs., Albuquerque, N. Mex.
TRANSITION FROM MIXED TO FORCED CONVECTION FOR OPPOSING VERTICAL FLOWS IN LIQUID-SATURATED POROUS MEDIA
D. C. Reda 1985 7 p refs Presented at the International Syposium on Geothermal Energy, Kailua Kona, Hawaii, 26 Aug. 1985
(Contract DE-AC04-76DP-00789)
(DE85-010662; SAND-85-0270C; CONF-850801-32) Avail: NTIS HC A02/MF A01

Mixed-convection phenomena can occur within liquid-dominated geothermal reservoirs due to interactions of injected flows, or ground water flows, with the buoyancy-induced fluid motion. This problem was studied experimentally and numerically for the case of opposing flows about a vertical heat source in a liquid-saturated porous medium. The ratio of the Rayleigh number (Ra) to the Peclet number (Pe) was identified as the nondimensional parameter which characterizes the relative influence of buoyancy-driven to pressure-gradient-driven fluid motion. The transition from mixed to forced convection was numerically determined to be (Ra/Pe) approx. = 0.5, where the minus sign denotes superimposed downflow. Agreement between measured and predicted thermal-field results showed that the finite-element code of Gartling and Hickox can be used to model low-temperature (single-phase) geothermal reservoirs throughout the natural, mixed, and forced convection regimes. DOE

N86-14545# Georgia Inst. of Tech., Atlanta.
DAA MODAL ANALYSIS FOR PARAMETRIC INVESTIGATIONS OF FLUID-STRUCTURE INTERACTION IN UNDERWATER SHOCK, REVISION 2
J. H. Ginsberg and C. E. Rosenkilde Feb. 1985 26 p Presented at the 55th Shock and Vibration Symposium, Dayton, Ohio, 23 Oct. 1984 Prepared in cooperation with California Univ., Livermore, Lawrence Livermore Lab.
(Contract W-7405-eng-48)
(DE85-012920; UCRL-91079-Rev-2; CONF-8410159-1-Rev-2) Avail: NTIS HC A03/MF A01

A program is initiated with the goal of developing a simulation of the underwater shock response of submarines. This capability is to be employed for systems analysis studies of a variety of tactical parameters, especially the orientation of the shock wave

relative to the structure. It is deemed acceptable to develop generic analytical models that avoid the details of specific structures, and the number of degrees of freedom is limited by the need for computational efficiency. These objectives were met by using the modal expansion version of the doubly asymptotic approximation. This technique is implemented in a modular form that permits progressive enhancements of a basic model. The concept is to partition the system into substructures that are not inertially coupled. Based on these concepts three varients on a basic model are described; each modification provides the capability to evaluate different aspects of the system. The basic model consists of a rigid cylinder capped by hemispheres subjected to a shock wave arriving from an arbitrary heading angle. The REFLECT model extends this fundamental model to treat multiple shock waves associated with reflections from the surface and bottom. This analysis employs a vectorial superposition of the CAPS response for each incident wave. To assess the importance of an internal dead load, such as a reactor, the CAPS model is extended. The new version includes a large internal mass suspended from the cylinder by four springs that give equivalent axial, transverse and rotational suspension stiffnesses. The center of mass of this dead load can be located arbitrarily along the axis of symmetry of the cylinder. DOE

N86-14546# Oak Ridge National Lab., Tenn.
ANALYSIS OF TRANSIENT THERMAL MEASUREMENTS ON FIBROUS INSULATIONS OBTAINED WITH AN UNGUARDED FLAT TESTER
D. W. Yarbrough, D. L. McElroy, T. W. Tong, and J. K. Wood, III 1985 22 p refs Prepared in cooperation with Kentucky Univ., Lexington and Tennessee Technological Univ., Cookeville
(Contract DE-AC05-84OR-21400)
(DE85-011436; DOE/OR-21400/T142) Avail: NTIS HC A02/MF A01

The unguarded screen tester is a useful apparatus for measuring both steady-state and transient thermal properties. Agreement between calculated and measured time-temperature curves obtained, for example, with a constant physical property analytical model however is not satisfactory. The agreement between calculated and measured values is not improved by the introduction of a shine-through radiative term that is independent of the conductive transport. Numerically-derived time-temperature curves that use measured k/sub a/(T) and C(T) and no adjustable parameters differ as much as 1K during the first 600 seconds of a transient. Agreement between measured and calculated transient screen temperatures to better than + or - 0.25 K is achieved by treating the C of the screen heater as an adjustable parameter. The analysis of transient data for the two reference materials is complicated by the presence of a heat of transition in the temperature range of interest. The effects of coupled conduction-radiation transport have not been included in the present analysis and this may be the reason for difficulties in describing the initial segment of the time-temperature curves. The results and analyses presented identify a need for chemical characterization of thermal reference materials. DOE

N86-14547# Centre Technique des Industries Mecaniques, Senlis (France).
STUDY OF THE VIBRATIONAL BEHAVIOR OF A PLATE EXPOSED TO A FLUID FLOW ALONG ONE OF ITS FACES Final Report [ETUDE DU COMPORTEMENT VIBRATOIRE D'UNE PLAQUE SOUMISE A UN ECOULEMENT PARIETAL SUR UNE SEULE DE SES FACES]
J. H. Batis Feb. 1985 29 p In FRENCH
(CETIM-103-050) Avail: NTIS HC A03/MF A01

Vibration of a plate with fluid flow on one face, as encountered in the aerospace industry, is discussed. The risk of instabilities due to gas-structure coupling is considered. Aeroelastic and hydroelastic models are examined. The Dowell model is adopted and a numerical example of a 0.2 m x 0.2 m plate is presented. A water flow and two thickness are assumed. The developed formula shows the presence of instability characterized as divergence. It is recognized that the velocity limits calculated are rough approximations. Author (ESA)

N86-14548# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
ELEMENTARY PROCESSES OF ELECTRONICALLY EXCITED CARBENES IN THE GAS PHASE Thesis [ELEMENTARPROZESSE ELEKTRONISCH ANGEREGTER CARBONE IN DER GASPHASE]
G. Dornhoefer Feb. 1985 160 p refs In GERMAN
(MPIS-3/1985; ISSN-0436-1199) Avail: NTIS HC A08/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 33

Electronically excited carbene particles and reaction products were investigated at room temperature in order to determine velocity constants. The study was performed by examining the formation, dynamics and reactions of electronically excited carbenes. Laser-induced fluorescence was applied; the induced fluorescence was specially integral or spectrally resolved in real time. Fluorescence lifetime, fluorescence spectra, as well as reaction products and product concentrations were directly determined. Author (ESA)

N86-14549# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany).
FLUID SLOSH STUDIES. VOLUME 1: STUDY OF SLOSH DYNAMICS OF FLUID FILLED CONTAINERS ON THREE-AXIS STABILIZED SPACECRAFT Final Report
H.-G. Beig Paris ESA 29 Nov. 1984 84 p refs 2 Vol.
(Contract ESA-5328/83/NL-BI(SC))
(ESA-CR(P)-2077-Vol-1) Avail: NTIS HC A05/MF A01

The problems of the localization of fluid monopropellants in spacecraft tanks are documented. A mathematical formulation and an approximate solution of the cross section of the equilibrium shapes of the liquid surfaces is given. Sample calculations are performed on a tank of type TV-SAT, and guidelines for propellant management devices are derived. In order to obtain mechanical analogs for the dynamic calculation of coupling between liquid motion and spacecraft motion, as input for the attitude control system, use of simplified models of liquid motion was considered. However, the low degree of accuracy because of necessary approximations, and the difficulty in ostimating model accuracy, make comparison with experiment necessary. Experiment designs for low gravity tests are given. Author (ESA)

N86-14550# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany).
FLUID SLOSH STUDIES. VOLUME 2: STUDY OF SLOSH DYNAMICS OF FLUID FILLED CONTAINERS ON SLOWLY ROTATING SPACECRAFT Final Report
K. Ebert Paris ESA 29 Nov. 1984 103 p refs 2 Vol.
(Contract ESA-5328/83/NL-BI(SC))
(ESA-CR(P)-2077-Vol-2) Avail: NTIS HC A06/MF A01

Fuel sloshing during slow rotation of spacecraft is discussed. The theory for slowly rotating spacecraft is developed completely for the three-dimensional case with no rotational symmetry. Expressions for the axisymmetric case are also derived. The three-dimensional problem (tanks with offset from the spin axis) is solved numerically only for spherical tanks. Tanks on the spin axis can have an arbitrary axisymmetric shape. The stability of the system is analyzed. Two cases are distinguished: dynamic instability caused by parameter combinations; and instability caused by liquid viscosity. In the dynamically instable region, the eigenfrequency of the satellite motion and of the internal rotational motion of the liquid coincide. The time constant of the dynamic instability is much smaller than the time constant for the instability caused by the energy dissipation in the boundary layer of the liquid. The control of the attitude motion of rotating systems is easier for slow spin rate because time constants of the rotational motion of the liquid depend directly on the spin rate and are large for slow rotations; and the motion of the free surface is stabilized by surface tension effects. Author (ESA)

N86-14551# Ruhr Univ., Bochum (West Germany). Lehrstuhl Thermodynamik 2.

AN APPARATUS FOR PRESSURE, VOLUME, TEMPERATURE (P,V,T) MEASUREMENTS IN THE CRITICAL REGION OF PURE FLUIDS Final Report, Apr. 1984

Hans-Georg Kratz and Wolfgang Wagner Bonn Bundesministerium fuer Forschung und Technologie Jun. 1985 101 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-W-85-006; ISSN-0170-1339) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 21.50

A measuring apparatus was developed to allow accurate pressure, volume and temperature measurements near the critical point of ideal fluids to be performed under weightlessness. The measurements are necessary to develop empirical equations of state and verify the phase transformation theory and critical phenomena of ideal fluids. The apparatus is equipped with 11 thermostatted cells containing the test substance with various density values and used simultaneously. The middle reference cell contains the test substance with a critical density. The efficiency and reliability of the apparatus are demonstrated by the good agreement between the measured CO2 vapor pressures and the known data. Further investigation is needed to explain the pressure differences between the cells for measures in the two-phase region and to demonstrate the applicability of the apparatus for measurements in weightlessness. Author (ESA)

N86-14552# Institut Franco-Allemand de Recherches, St. Louis (France).

STUDY OF THE LIMITS OF COMPUTERIZED LASER CHRONOPHOTOGRAPHY, APPLIED TO VELOCITY FIELD MEASUREMENT IN LAMINAR OR TURBULENT AIR OR WATER FLOW [ETUDES DES LIMITES DE LA CHRONOPHOTOGRAPHIE LASER INFORMATISEE, APPLIQUEE A LA MESURE DES CHAMPS DE VITESSE INSTANTANEES D'ECOULEMENT D'AIR OU D'EAU, LAMINAIRES ET TURBULENTS]

J. Schwab, P. Smigielski, and C. Maillot (Strasbourg Univ.) 9 Jul. 1984 32 p In FRENCH

(Contract DRET-81-626)

(ISL-R-115/84) Avail: NTIS HC A03/MF A01

A velocity field measurement system and data processing is described. A video camera with an image memory of 512x512x8 bit with silicon target with diodes array is used. An Icotech image processing system and a Sirius 1 microcomputer with PASCAL language was adopted. A YAG laser works automatically under computer control. The programs are described. The data acquisition and processing time to obtain a velocity field chart is reduced to 20 min. The spatial resolution is less than with the photographic method. Author (ESA)

N86-14553# Institut Franco-Allemand de Recherches, St. Louis (France).

MEASUREMENT OF VELOCITY FIELDS IN FLUIDS BY MICROPARTICLE IMAGE PROCESSING Final Report [MESURES DE CHAMPS DE VITESSES DANS LES FLUIDES PAR TRAITEMENT D'IMAGES DE MICROPARTICULES]

P. Smigielski and J. Haertig 13 Feb. 1985 18 p refs In FRENCH

(Contract DRET-81-626)

(ISL-R-103/85) Avail: NTIS HC A02/MF A01

The representation of a fluid velocity field is studied by association of coherent optical analog techniques (optical Fourier transform) to numerical image processing. An axisymmetric air jet and a water jet of a fraction of a m/sec velocity are considered. A double exposed photograph obtained with a double pulse laser beam is treated by optical transform and numerical analysis. A video camera and ultra fast Fourier transform were also tried. The measurement of interference fringes obtained with a continuous emission laser gives the velocity vector in the zone. The resolution of existing video cameras is not sufficient for this technique. Author (ESA)

N86-14416# Osaka Univ. (Japan). Dept. of Environmental Engineering.

NUMERICAL COMPARISON BETWEEN THERMAL LOAD OF WARM AIR HEATING SYSTEM AND RADIANT HEATING SYSTEM. 1: OCCURRENCE OF CRITICAL CONVECTIVE HEAT TRANSFER COEFFICIENT

Kazuo Naito, Minoru Mizuno, and S. Mahmoud Ghaemmaghami *In its* Technology Reports of the Osaka University, Vol. 35, Nos. 1800-1818 Oct. 1985 p 299-308 refs (For primary document see N86-14405 05-31)

Avail: NTIS HC A09/MF A01

N86-14425# Yamaguchi Univ., Ube (Japan).

VISUAL OBSERVATION OF AN AXISYMMETRIC IMPINGING JET

Junji Kurima, George Miyake, Hiroaki Sera, and Masahide Miyamoto *In its* Memoirs of the Faculty of Engineering, Yamaguchi University, Vol. 36, No. 1 Oct. 1985 p 45-49 refs In JAPANESE; ENGLISH summary (For primary document see N86-14418 05-31)

Avail: NTIS HC A09/MF A01

N86-14228# Deutsche Gesellscaft fuer Luft und Raumfahrt, Bonn (West Germany).

SUMMARY REPORT ON THE WORKING GROUP FOR CONFERENCE 3: SOLUTIONS OF THE FULL POTENTIAL EQUATIONS [ZUSAMMENFASSENDER BERICHT DER ARBEITSGRUPPE ZUR SITZUNG 3. LOESUNGEN DER VOLLSTAENDIGEN POTENTIAL-GLEICHUNG]

E. H. Hirschel, K. D. Klevenhusen, S. Leicher, and H. Sobieczky *In its* The State of Development Research in Numerical Aerodynamics in West Germany 1984 p 11-13 In GERMAN (For primary document see N86-14225 05-02)

Avail: NTIS HC A08/MF A01

N86-14230# Karlsruhe Univ. (West Germany). Inst. fuer Hydromechanik.

A NUMERICAL PROCEDURE TO SOLVE NAVIER-STOKES EQUATIONS AT THE INSTITUTE OF HYDROMECHANICS, KARLSRUHE UNIVERSITY [NUMERISCHE VERFAHREN ZUR LOESUNG DER NAVIER-STOKES-GLEICHUNGEN AM INSTITUT FUER HYDROMECHANIK DER UNIVERSITAET KARLSRUHE]

B. Schoenung, A. O. Demuren, S. Majumdar, and W. Rodi *In* DGLR The State of Development Research in Numerical Aerodynamics in West Germany 1984 p 20-26 refs In GERMAN (For primary document see N86-14225 05-02)

Avail: NTIS HC A08/MF A01

N86-14237# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).

THERMOFLUIDYNAMIC CALCULATION OF THE PLANE FLOW DISTRIBUTION OF A SECONDARY INJECTION [THERMOFLUIDDYNAMISCHE BERECHNUNG DES EBENEN STROEMUNGSFELDES EINER SEKUNDAER-INJEKTION]

H. Schneider *In* DGLR The State of Development Research in Numerical Aerodynamics in West Germany 1984 p 72-73 In GERMAN (For primary document see N86-14225 05-02)

Avail: NTIS HC A08/MF a01

N86-14244# Gesellschaft fuer Mathematik und Datenverarbeitung, St. Augustin (West Germany).

DEVELOPMENT OF MULTIGRID ALGORITHMS FOR PROBLEMS FROM FLUID DYNAMICS

Klaus Becker and Ulrich Trottenberg *In* DGLR The State of Development Research in Numerical Aerodynamics in West Germany 1984 p 112-120 refs In GERMAN (For primary document see N86-14225 05-02)

Avail: NTIS HC A08/MF A01

N86-14906# Wisconsin Univ., Madison. Mathematics Research Center.

OPTIMAL CONTROL TECHNIQUES FOR COMPUTING STATIONARY FLOWS OF VISCOELASTIC FLUIDS WITH MEMORY

P. LeTallec *In* ARO Transactions of the 2nd Army Conference

on Applied Mathematics and Computing Feb. 1985 p 49-59 (For primary document see N86-14902 05-59)
(AD-P004905) Avail: NTIS HC A99/MF E03 CSCL 12/1

N86-14917# Ballistic Research Labs., Aberdeen Proving Ground, Md.
REPRESENTATION OF TWO-PHASE FLOWS BY AVERAGING
A. Celmins *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 199-223 (For primary document see N86-14902 05-59)
(AD-P004916) Avail: NTIS HC A99/MF E03 CSCL 12/1

N86-14919# Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Mathematical Sciences.
FLUID MECHANICS OF QUENCHING
D. A. Drew, R. Brent, S. Melly, W. Schroeder, and S. Wells *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 231-252 (For primary document see N86-14902 05-59)
(AD-P004918) Avail: NTIS HC A99/MF E03 CSCL 20/4

N86-14922# Cornell Univ., Ithaca, N.Y. Dept. of Theoretical and Applied Mechanics.
THE STEFAN PROBLEM OF DETONATION THEORY
A. A. Oyediran and G. S. S. Ludford *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 273-283 (For primary document see N86-14902 05-59)
(AD-P004921) Avail: NTIS HC A99/MF E03 CSCL 12/1

N86-14925# Minnesota Univ., Minneapolis. Dept. of Aerospace Engineering and Mechanics.
EXAMPLES AND SIGNIFICANCE OF CHANGE OF TYPE IN VISCOELASTICITY
D. D. Joseph, M. Renardy, and J. C. Saut *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 313-318 (For primary document see N86-14902 05-59)
(Contract DAAG29-82-C-0051)
(AD-P004924) Avail: NTIS HC A99/MF E03 CSCL 12/1

N86-14941# Army Chemical Research and Development Center, Aberdeen Proving Ground, Md.
NUMERICAL SIMULATION OF FLUID EJECTION FROM A SPINNING CYLINDER
P. D. Fedele *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 635-647 (For primary document see N86-14902 05-59)
(AD-P004941) Avail: NTIS HC A99/MF E03 CSCL 12/1

N86-14942# Wisconsin Univ., Madison. Mathematics Research Center.
NOTE ON EVAPORATION IN POROUS MEDIA
R. E. Meyer *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 693-711 (For primary document see N86-14902 05-59)
(Contract DAAG29-80-C-0041; Grant NSF MCS-82-15064)
(AD-P004943) Avail: NTIS HC A99/MF E03 CSCL 07/4

N86-14943# Ballistic Research Labs., Aberdeen Proving Ground, Md.
JET-CONTAMINANT INTERACTIONS IN CONFINED GEOMETRIES
In ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 713-728 (For primary document see N86-14902 05-59)
(AD-P004944) Avail: NTIS HC A99/MF E03 CSCL 12/1

N86-14948# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Mathematics.
ON PHASE TRANSITIONS WITH INTERFACIAL ENERGY
M. E. Gurtin *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics Math. and Computing Feb. 1985 p 809-813 (For primary document see N86-14902 05-59)
(Contracts DAAG29-82-K-0002; DAAG29-80-C-0041)
(AD-P004949) Avail: NTIS HC A99/MF E03 CSCL 12/1

N86-14954# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering, Science and Mechanics.
HIGHLY VISCOUS FLUID FLOW IN A SPINNING AND NUTATING CYLINDER
T. Herbert *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 883-893 (For primary document see N86-14902 05-59)
(Contracts DAAG29-82-K-0129; DAAK11-83-K-0011)
(AD-P004955) Avail: NTIS HC A99/MF E03 CSCL 12/1

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources.* For related information see also *06 Aircraft Instrumentation,* and *19 Spacecraft Instrumentation.*

N86-14554*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FORMATION AND CHARACTERIZATION OF SIMULATED SMALL DROPLET ICING CLOUDS
Robert D. Ingebo Jan. 1986 13 p refs Proposed for presentation at the 24th Aeospace Sciences Meeting, Reno, Nev., 6-8 Jan. 1986; sponsored by AIAA
(NASA-TM-87180; E-2828; NAS 1.15:87180) Avail: NTIS HC A02/MF A01 CSCL 14B

Two pneumatic two-fluid atomizers operating at high liquid and gas pressures produced water sprays that simulated small droplet clouds for use in studying icing effects on aircraft performance. To measure median volume diameter, MVD or D sub v.5, of small droplet water sprays, a scattered-light scanning instrument was developed. Drop size data agreed fairly well with calculated values at water and nitrogen pressures of 60 and 20 psig, respectively, and at water and nitrogen pressures of 250 and 100 psig, respectively, but not very well at intermediate values of water and nitrogen pressure. MVD data were correlated with D sub 0, W sub N, and W sub w, i.e., orifice diameter, nitrogen, and water flowrate, respectively, to give the expression for MVD in microns. Author

N86-14555*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THREE-DIMENSIONAL, TRANSONIC ROTOR FLOW FIELD RECONSTRUCTED FROM HOLOGRAPHIC INTERFEROGRAM DATA
John K. Kittleson, Yung H. Yu, and Friedhelm Becker (Max-Planck-Inst. fuer Stroemungsforschung, Goettingen, West Germany) Oct. 1985 21 p refs
(NASA-TM-86816; Rept-85347; NAS 1.15:86816; USAAVSCOM-TR-85-A-10) Avail: NTIS HC A02/MF A01 CSCL 14E

Holographic interferometry and computer-assisted tomography (CAT) are used to determine the transonic flow field of a model rotor blade in hover. A pulsed ruby laser records 40 interferograms with a 61 cm-diam view field near the model rotor-blade tip operating at a tip Mach number of 0.90. After digitizing the interferograms and extracting fringe-order functions, the data are transferred to a CAT code. The CAT code then calculates pressure coefficients in several planes above the blade surface. The values from the holography-CAT method compare favorably with previously obtained numerical computations and laser velocimeter measurements at most locations near the blade tip. The results demonstrate the technique's potential for three-dimensional transonic rotor flow studies. Author

N86-14556# Verein Deutscher Ingenieure, Duesseldorf (West Germany).
MEASURING METHODS USING OPTOELECTRONIC SEMICONDUCTOR COMPONENTS [MESSVERFAHREN MIT OPTOELEKTRONISCHEN HALBLEITER-BAUELEMENTEN]
1985 253 p refs In GERMAN Presented at Conference on Optpelectronics Measuring Methods, Lahnstein, West Germany, 6-7 Feb. 1985
(GNR-5) Avail: NTIS HC A12/MF A01

Physical effects of optoelectronic components, and their utilization in measuring techniques are reviewed. Semiconductor emitters and detectors for the visible, near IR, middle IR, and far IR spectral ranges are treated. Electrooptical distance measuring methods, velocity and flow measurements using optoelectronic components, laser interferometric linear measuring techniques, and autofocussing are presented. Applications of light barriers, contactless temperature measuring techniques, and process analysis measuring techniques are outlined. Infrared gas analysis methods in medicine, spectroscopic environmental measuring techniques, and signal transmission using light guide fibers are discussed. For individual titles, see N86-14557 through N86-14571.

N86-14557# Fraunhofer Inst. fuer Physikalische Messtechnik, Freiburg (West Germany).
PHYSICAL EFFECTS OF OPTOELECTRONIC COMPONENTS, AND THEIR UTILIZATION IN MEASUREMENT TECHNIQUES [PHYSIKALISCHE EFFEKTE OPTOELEKTRONISCHER BAUELEMENTE UND IHRE NUTZUNG IN DER MESSTECHNIK]
Horst Preier *In* Verein Deutscher Ingenieure Measuring Methods Using Optoelectronics Semiconductor Components 1985 p 1-15 refs In GERMAN (For primary document see N86-14556 05-35)
Avail: NTIS HC A12/MF A01

Measuring methods using optoelectronic components, especially lasers, are reviewed. The mechanism and characteristics of optoelectronic semiconductor components are explained. Measuring principles are described. The favorable characteristics of lasers and optoelectronic semiconductor components are demonstrated with a contactless laser scanner linear measurement system, a particle analyzer, and an optical sounding system for three-dimensional television. Many optoelectronic measuring systems still use the relatively expensive gas laser. An increased use of semiconductor lasers is expected because of their good beam properties, high intensity and long lifetime. The application of robust glass fiber optics opens possibilities in the visible and IR domains. Author (ESA)

N86-14558# Telefunken Electronic G.m.b.H., Heilbronn (West Germany).
SEMICONDUCTOR EMITTERS IN THE VISIBLE AND NEAR IR SPECTRAL RANGE [HALBLEITER-EMITTER IM SICHTBAREN UND NAHEN INFRAROTEN SPEKTRALBEREICH]
Elmer Wagner and Klaus Gillessen *In* Verein Deutscher Ingenieure Measuring Methods Using Optoelectronic Semiconductor Components 1985 p 17-36 In GERMAN (For primary document see N86-14556 05-35)
Avail: NTIS HC A12/MF A01

Semiconductor emitters for the spectral domain covering the visible (from 560 nm) to the near IR are treated. Junction semiconductors from groups 3 and 5 are the starting materials for semiconductor emitters. The emission wavelengths can be varied by the production of mixed crystals of variable composition (GaxAS1-x P, Aly GA 1-y As). The components, developed as p-m-diodes, emit radiation if they are operated in the forward direction. By the development of heterostructures with different materials (GaAs and AlGaAs, InP and InGaAs) components with an exceptionally favorable emission characteristic curve of the coupling in optical systems or fibers can be produced, such as emitter LED's and semiconductor lasers, the peculiarities of which are discussed with a view to applications in measurement techniques. Author (ESA)

N86-14559# Fraunhofer Inst. fuer Physikalische Messtechnik, Freiburg (West Germany).
SEMICONDUCTOR EMITTERS FOR THE MIDDLE AND FAR IR SPECTRAL RANGE [HALBLEITER-EMITTER FUER DEN MITTLEREN UND FERNEN INFRAROTEN SPEKTRALBEREICH]
K.-H. Bachem *In* Verein Deutscher Ingenieure Measuring Methods Using Optoelectronic Semiconductor Components 1985 p 37-45 refs In GERMAN Sponsored by Bundesministerium fuer Forschung und Technologie (For primary document see N86-14556 05-35)
Avail: NTIS HC A12/MF A01

The technical state of the art of semiconductor injection lasers based on lead-tin-chalcogenides, emitting in the middle and far IR domains is outlined. Commercially available diffusion lead-tin-chalcogenide lasers cover the complete spectral range from 3.5 to 30 micron without gaps. For this range there are no spontaneously emitting semiconductor sources. Essential physical effects favor coherently emitting radiators. The use of presently available lasers in the measurement techniques is still strongly limited by the low laser operation temperature. This threshold is expected to be crossed in the near future. The double-heterojunction lasers under development work at significantly higher temperatures than diffusion lasers, thereby clearly reducing the cost of cooling apparatus and broadening the application domain of these lasers for spectrometric measurement techniques. Author (ESA)

N86-14560# Telefunken Electronic G.m.b.H., Heilbronn (West Germany).
SEMICONDUCTOR DETECTORS FOR THE MIDDLE AND FAR IR SPECTRAL RANGE [HALBLEITER-DETEKTOREN FUER DEN MITTLEREN UND FERNEN INFRAROTEN SPEKTALBEREICH]
Horst Maier *In* Verein Deutscher Ingenieure Measuring Methods Using Optoelectronic Semiconductor Components 1985 p 47-60 ref In GERMAN (For primary document see N86-14556 05-35)
Avail: NTIS HC A12/MF A01

Quantum IR detectors based on semiconductor materials are treated. Compared to thermal detectors they have higher sensitivity and shorter response times. However, they have to be adapted to each specific application due to their operation temperature, power supply, etc. For heat image cameras Hg1-x cdxTe prevails as detector material; higher thermal contrast and high geometrical resolution are obtained with multielement detectors. Two-dimensional detector mosaics with a high element density are under development. Author (ESA)

N86-14561# Verein Deutscher Ingenieure, Duesseldorf (West Germany).
ELECTROOPTICAL METHODS TO MEASURE DISTANCE
Rudolf Grosskopf *In its* Measuring Methods Using Optoelectronic Semiconductor Components 1985 p 61-81 refs In GERMAN (For primary document see N86-14556 05-35)
Avail: NTIS HC A12/MF A01

Electrooptical distance measuring methods are discussed. The measuring principles suppose that at least one of both measuring points moves freely, and do not use mass embodiment. Methods based on the characteristics of electromagnetic waves are satisfactory regarding accuracy, quality of the measuring points, and work. Suitability for distance measurement for triangulation lies in the rectilinear propagation, for the measurement with amplitude modulated light in the constant propagation velocity, for the measurement with interferometers in the interference capability and the constancy of the wavelength, for the pulse time-of-flight method in the constant propagation velocity, for radar measurement in the modulation capability, and for the red shift in the Doppler effect characteristic of electromagnetic waves. Author (ESA)

N86-14562# Physikalisch-Technische Bundesanstalt, Brunswick (West Germany).
VELOCITY AND FLOW MEASUREMENTS USING OPTOELECTRIC COMPONENTS [GESCHWINDIGKEITS- UND DURCHFLUSMESSUNGEN MIT OPTOELEKTRONISCHEN BAUELEMENTEN]
D. Dopheide and G. Taux *In* Verein Deutscher Ingenieure

Measuring Methods Using Opyoelectronic Semiconductor Components 1985 p 83-109 refs In GERMAN (For primary document see N86-14556 05-35)
Avail: NTIS HC A12/MF A01

Methods to measure average and instantaneous velocities of solid bodies, gases, and fluids, based on optical methods, are described. Besides conventional methods, the application of the laser Doppler measurement techniques for the measurement of local flow velocities is emphasized; the latter method is increasingly used in flow measurements. Development efforts aiming at the application of laser diodes for laser Doppler systems are described. Author (ESA)

N86-14563# Verein Deutscher Ingenieure, Duesseldorf (West Germany).
LASER INTERFEROMETRIC LINEAR MEASURING TECHNIQUES c36
Hans-H. Schuessler *In* Verein Deutscher Ingenieure Measuring Methods Using Optoelectronic Semiconductor Components 1985 p 111-133 refs In GERMAN (For primary document see N86-14556 05-35)
Avail: NTIS HC A12/MF A01

The state of the art of laser interferometry, applications, and developments are treated. The high level of laser interferometry for linear measurement techniques led to a broadening and diversification of applications in the field of precision tests of machine tools and measuring equipment, and to calibration in research and development. The construction of, and the requirements for a laser interferometer are outlined. Many special setups can individually be built by the variation and combination of optical components. Open questions and wishes of users in the fields of compensation systems, built-in odometric systems on machines, and the development of light and small interferometers with semiconductor lasers are discussed. Author (ESA)

N86-14564# Verein Deutscher Ingenieure, Duesseldorf (West Germany).
AUTOFOCUSING [AUTOFOKUSSIERUNG]
Burkhard Neumann *In its* Measuring Methods Using Optoelectronic Semiconductor Components 1985 p 135-148 refs In GERMAN (For primary document see N86-14556 05-35)
Avail: NTIS HC A12/MF A01

Characteristics, problems, and applications of autofocusing (AF) systems are described. Active AF-systems often need luminous object surfaces; their use is advantageous in case of moving or weakly luminous objects. Passive AF-systems function for reflected light and transilluminated objects. Quality characteristics are derived from the principle of the design of feedback control system and regulating units, and from the intelligence of the system (adaptive control, recognition of perturbation signals and relative extrema). Author (ESA)

N86-14565# Verein Deutscher Ingenieure, Duesseldorf (West Germany).
MEASURING-TECHNICAL APPLICATIONS OF LIGHT BATTERIES [MESSTECHNISCHE ANWENDUNGEN VON LICHTSCHRANKEN]
J. Erdmann *In its* Measuring Methods Using Optoelectronic Semiconductor Components 1985 p 149-161 ref In GERMAN (For primary document see N86-14556 05-35)
Avail: NTIS HC A12/MF A01

The use of light barriers as contactless sensors is discussed. The advantage of light barriers lies in the fact that they work faster, free of fatigue, and hence more reliably than the human eye, for special tasks and with relatively limited technical expense. One-way light barriers and reflex barriers are presented. The light beam from emitter to receiver (light beam geometry, reflection) is outlined. Ways of affecting the electromagnetic radiation (affecting beam power, wavelength, and beam direction) are discussed. The electronic signal evaluation is explained.
Author (ESA)

N86-14566# Heimann G.m.b.H., Wiesbaden (West Germany).
CONTACTLESS TEMPERATURE MEASURING TECHNIQUES
Walter Glockmann *In* Verein Deutscher Ingenieure Measuring Methods Using Optoelectron. Semiconductor Components 1985 p 163-176 refs In GERMAN (For primary document see N86-14556 05-35)
Avail: NTIS HC A12/MF A01

Physical fundamentals and techniques of contactless temperature measurements are discussed. Contactless temperature determination is based on the measurement of the characteristic IR radiation of each body. Perturbations, differing radiation characteristics of the measured object, external radiation, and absorption lead to measurement errors. Sensor-specific measurement errors are compensated in the data recorder. The data recorder Pyrosor is conceived for measuring systems with several measuring locations, allowing, together with a central evaluation, a compensation of external perturbations. The use of several identical recorders additionally allows the determination of temperature distributions over larger measuring surfaces and provides a higher reliability by the larger redundancy of the sensors.
Author (ESA)

N86-14567# Hartmann und Braun A.G., Frankfurt am Main (West Germany).
SPECTROSCOPIC GAS AND LIQUID PROCESS MEASURING TECHNIQUES [SPEKTROSKOPISCHE GAS- UND FLUESSIGKEITS-PROZESSMESSTECHNIK]
Werner Schaefer *In* Verein Deutscher Ingenieure Measuring Methods Using Optoelectronic Semiconductor Components 1985 p 177-195 refs In GERMAN (For primary document see N86-14556 05-35)
Avail: NTIS HC A12/MF A01

The state of the art in the field of process analysis measuring techniques is outlined. The physical fundamentals of spectroscopic process analysis measuring techniques, and utilization fields are given. Developments using optoelectronic components are reported on. Author (ESA)

N86-14568# Draegerwerk A.G., Luebeck (West Germany).
OPTICAL GAS ANALYSIS IN MEDICINE [OPTISCHE GASANALYSE IN DER MEDIZIN]
Iven Pockrand *In* Verein Deutscher Ingenieure Measuring Methods Using Optoelectronic Semiconductor Components 1985 p 197-209 refs In GERMAN (For primary document see N86-14556 05-35)
Avail: NTIS HC A12/MF A01

Infrared optical gas analysis methods for analysis and monitoring of gases for narcosis and artificial respiration are described. The advantages of IR absorption measurements for gas concentration determination are demonstrated. The medical quality, requirements for measuring equipment for continuous breathing gas analysis are fulfilled by IR systems. Desirable improvements mainly concern weight and volume of the measuring head, and the simultaneous determination of all relevant gases with a single measuring head. This requires an extension of the practically usable spectral range into the middle IR, where the volatile anesthetics show substantially stronger absorption bands. This extension is only successful if for the longer wavelength spectral range efficient emitters and stable, fast detectors can be used, whose power characteristics approach these of presently available component in the range between 3 and 4.5 micrometers. Author (ESA)

N86-14569# Fraunhofer Inst. fuer Physikalische Messtechnik, Freiburg (West Germany).
SPECTROSCOPIC ENVIRONMENTAL MEASURING TECHNIQUES [SPEKTROSKOPISCHE UMWELTMESSTECHNIK]
Gerhard Schmidtke and Wolfgang Kohn *In* Verein Deutscher Ingenieure Measuring Methods Using Optoelectronic Semiconductor Components 1985 p 211-220 refs In GERMAN (For primary document see N86-14556 05-35)
Avail: NTIS HC A12/MF A01

Spectrometers with broadband light sources, and atmospheric trace gas analysis using diode lasers are presented. The sensitivity of the instruments is increased by orders of magnitude by the

development of line detectors and diode lasers, and by the application of data evaluation methods of other fields (derivative spectroscopy). The broad combination possibilities of several spectrometer types allow a substantial extension of the application domain of spectroscopic trace gas analyzers. Author (ESA)

N86-14570# Telefunken Electronic G.m.b.H., Heilbronn (West Germany).
SIGNAL TRANSMISSION USING LIGHT GUIDE FILTERS [SIGNALUEBERTRAGUNG MIT LICHTLEITFASERN]
J. Angerstein *In* Verein Deutscher Ingenieure Measuring Methods using Optoelectronic Semiconductor Components 1985 p 221-232 In GERMAN (For primary document see N86-14556 05-35)
Avail: NTIS HC A12/MF A01

Glass fiber data transmission techniques are discussed. Components such as plastic and glass fibers, emitter elements, detectors, and plugs are described. The techniques are required to transmit data whose transmission rates are determined by analog to digital converters. The data rates are seldom higher than 10 Mbit/sec, even in cases of serial transmission. Transmission distances up to 2000 m can be realized with relatively simple means. Author (ESA)

N86-14571# Verein Deutscher Ingenieure, Duesseldorf (West Germany).
SEMICONDUCTOR DETECTORS IN VISIBLE AND NEAR IR REGION
Werner Spaeth *In its* Measuring Methods Using Optoelectronic Semiconductor Components 1985 16 p In GERMAN (For primary document see N86-14556 05-35)
Avail: NTIS HC A12/MF A01

The physical fundamentals of photoconductors and junction receivers are explained. The technological possibilities are demonstrated, for example how switching times, noise, and spectral sensitivity of photodiodes can be influenced; pin-photodiodes, avalanche photodiodes, and photo integrated circuits are described. The silicon photodetector has the most important technical and economical significance, as photodiode, phototransistor, as well as photo-integrated circuit. Author (ESA)

N86-14572# Oklahoma State Univ., Stillwater. School of Electrical and Computer Engineering.
MODELING A LARGE RING RESONATOR GYROSCOPE Final Report, 1 Feb. 1984 - 31 Jan. 1985
H. R. Bilger 30 Mar. 1985 141 p
(Grant AF-AFOSR-0058-84)
(AD-A158293; AFOSR-85-0526TR) Avail: NTIS HC A07/MF A01 CSCL 03/1

The results obtained can be divided into three categories: (1) a feasibility study with focus on quantum noise and low frequency noise; (2) basic modeling of the ring with Gaussian beam and ray matrices; (3) technical design; effect of residual gas in ring on quality factor and light drag, scanning of beam, effect of misalignment and mismatch of source to ring, calibration procedures. The results show no obstacle yet to the goal of achieving a sensitivity of rotation rate of better than 10 to the -19th power (earth rate) in rings of 60 sq m size. Such a sensitivity which corresponds to a change of earth surface velocity of smaller than 4 cm/day, should surpass Lunar ranging methods, Lageos methods as well as VLBI-methods in accuracy, besides being a real time observational method for Earth rotation. GRA

N86-14573# SRI International Corp., Menlo Park, Calif. Artificial Intelligence Center.
INSTALLING A COPY OF THE ARPA/DMA IMAGE UNDERSTANDING TESTBED AT THE US ARMY ENGINEER TOPOGRAPHIC LABORATORIES Final Technical Report, 30 Jul. 1982 - 30 Jun. 1985
A. J. Hanson 30 Jun. 1985 10 p
(Contract MDA903-82-C-0385; ARPA Order 3862)
(AD-A158395) Avail: NTIS HC A02/MF A01 CSCL 14/5

The principal objective of this effort was to establish a functional copy of the SRI Image Understanding Testbed system of hardware and software at the U.S. Army Engineer Topographic Laboratories (ETL) Research Institute at Fort Belvoir, Virginia. Representative tasks included advising on the preparation of the ETL site for the Testbed system installation, purchasing the required hardware for installation at ETL, and arranging for availability of Testbed software systems. Other major tasks included supplementary hardware acquisition, installing Testbed software systems, and developing support software to enhance the overall capabilities of the system. We also assisted in establishing the ETL site as a node on the DDN ARPANET/MILNET network. Final tasks included installation of Lisp Machine software and associated consultation, as well as other general assistance and troubleshooting. The main beneficial results of this effort were the establishment at ETL of a state of the art research facility and the transfer to ETL of a large body of research technology carried out by SRI, as well as by other contributors to the DARPA Image Understanding research program. This project has provided essential elements of the foundation required to support the mission of the newly formed ETL Center for Artificial Intelligence. GRA

N86-14574# Aerospace Corp., El Segundo, Calif. Materials Sciences Lab.
PRECISION INTERFEROMETRIC DILATOMETER
E. G. Wolff and R. C. Savedra 12 Aug. 1985 33 p
(Contract F04701-83-C-0084)
(AD-A158684; TR-0084A(5935-12)-1; SD-TR-85-47) Avail: NTIS HC A03/MF A01 CSCL 14/2

An improved double Michelson laser interferometric dilatometer with an inexpensive automatic signal processor is described. The unit is suitable for studying materials having near-zero coefficients of thermal expansion (CTE) ranging from 100 to > 450 K. Delta L/L values to a resolution of less than 10 to the minus 7th power and instantaneous CTE values (to less than 10 to the minus 8th power per K) can be plotted in real time at regular intervals (> 30 s) to give time-related absolute expansion data of noncontacted samples of arbitrary shape or size. GRA

N86-14575# Naval Surface Weapons Center, Silver Spring, Md.
HIERARCHICAL RELAXATION METHODS FOR MULTISPECTRAL PIXEL CLASSIFICATION AS APPLIED TO TARGET IDENTIFICATION Final Report
E. A. Cohen, Jr. 1 Feb. 1985 90 p
(AD-A158694; NSWC/TR-84-54) Avail: NTIS HC A05/MF A01 CSCL 17/8

This report provides insights into the approaches toward image modeling as applied to target detection. The approach is that of examining the energy in prescribed wave-bands which emanate from a target and correlating the emissions. Typically, one might be looking at two or three infrared bands, possibly together with several visual bands. The target is segmented, using both first and second order modeling, into a set of interesting components and these components are correlated so as to enhance the classification process. A Markov-type model is used to provide an a priori assessment of the spatial relationships among critical parts of the target, and a stochastic model using the output of an initial probabilistic labeling is invoked. The tradeoff between this stochastic model and the Markov model is then optimized to yield a best labeling for identification purposes. In an identification of friend or foe (IFF) context, this methodology could be of interest, for it provides the ingredients for such a higher level of understanding. GRA

N86-14576# Aerodyne Research, Inc., Billerica, Mass.
INVESTIGATION OF HIGH EFFICIENCY GENERALIZED MATCHED FILTERS Final Report, Dec. 1983 - Mar. 1985
E. S. Gaynor and H. J. Caulfield Aug. 1985 33 p
(Contract F19628-84-C-0047)
(AD-A158698; ARI-RR-468; RADC-TR-85-134) Avail: NTIS HC A03/MF A01 CSCL 09/5

In a previous RADC contract Aerodyne worked on developing an improved algorithm for reducing the rotational dependency of matched filters for use in optical pattern recognition systems. This present contract takes the final result of that effort, the so-called

Generalized Matched Filter (GMF), applies the phase-only filter principle to it, and studies the results. Standard actual noisy IR images are used so the result can be compared to other such studies. Also included in this report is a brief discussion of complexity theory and how it might apply to optical computing efforts in the U.S. and elsewhere. GRA

N86-14577# Massachusetts Inst. of Tech., Cambridge.
DEVELOPMENT OF A FLOATING ELEMENT WALL SHEAR TRANSDUCER M.S. Thesis
S. W. Petri Jun. 1984 103 p Supersedes AD-A144794
(Contract N66314-70-A-0073)
(AD-A159038) Avail: NTIS HC A06/MF A01 CSCL 20/4

A highly linear passive floating element wall shear transducer has been developed which uses a sensitive frequency modulation technique to measure a capacitance change proportional to the displacement of the floating element for small deflections. The floating element is 4 mm square surrounded by a gap nominally 0.18 mm and protrudes into the boundary layer 9 micrometers. Scaled on inner parameters, each side of the sensing head measures about 290, the mean gap width is 13, and the element protrusion is 0.7. The transducer was tested in a turbulent boundary layer on a flat plate at momentum thickness Reynolds numbers of 3140, 3500, and 3760 and the results compared to wall shear stress estimates obtained from the law of the wall. The transducer was found to predict the steady mean wall shear stress within the limits of experimental uncertainty in all cases; transducer measurements of mean wall shear stress for momentum thickness Reynolds numbers of 3140 and 3500 were within 2 percent of the actual value. Transducer measurement of the unsteady mean wall shear stress was severely limited by a mechanical resonance in the transducer at 63 Hz. GRA

N86-14578# Ballistic Research Labs., Aberdeen Proving Ground, Md.
THE BALLISTIC RESEARCH LABORATORY FLASH X-RAY COMPUTED TOMOGRAPHY FACILITY FOR MICROSECOND EVENTS Final Technical Report
C. K. Zoltani, K. J. White, and F. A. DiBianca Sep. 1985 50 p
(AD-A159507; BRL-TR-2671) Avail: NTIS HC A03/MF A01 CSCL 14/2

A new technique using multiple flash X-ray sources for the determination of cross-sectional density profiles of rapidly translating or dynamically deforming objects is presented. The method, and extension of the concepts of medial tomography, allows stop-action survey of events with time constants at the low end of the microsecond range, making it suitable for problems of ballistic research and materials proof testing. This report discusses the design, the components, the capabilities, as well as the system studies which led up to the configuration which is under construction at BRL. GRA

N86-14579# Allied Bendix Corp., Kansas City, Mo.
EVALUATION OF ROBOT-AIDED ULTRASONIC THICKNESS MEASUREMENT
J. R. Lembke Aug. 1985 12 p
(Contract DE-AC04-76DP-00613)
(DE85-016936; BDX-613-3269) Avail: NTIS HC A02/MF A01

Wall thickness can be measured ultrasonically and usually this is performed by manually placing a probe at various locations on the outer contour of a part. This operation requires a high degree of operator skill because the probe must be positioned precisely and placed normal to the part surface for accurate measurements. As a means of automating the measurement process and minimizing the effects of human variability, robot placement of the ultrasonic probe was evaluated. With an appropriate adapter, a robot was used to move the probe to several positions on a part, and repeated thickness measurements were made at each location. The standard deviation of the thickness measurement was estimated to be 0.032 percent (maximum) of the measured wall thickness, with 95 percent confidence. This includes the variability of the measurement device as well as the variability of probe placement. Based on this experiment, the robot was judged to be capable of performing the ultrasonic thickness measurements. DOE

N86-14580# Sandia National Labs., Albuquerque, N. Mex.
INTEGRATED MONITORING SYSTEM 2 (IMS-2), USER'S MANUAL
M. H. Gallegos Aug. 1985 17 p
(Contract DE-AC04-76DP-00789)
(DE85-017386; SAND-85-0022) Avail: NTIS HC A02/MF A01

The IMS-2 was designed to monitor up to four unattended areas containing assets of safeguards interest through the use of video equipment and motion detectors. One module of the system equipment is the Inspector Display Module (IDM), which interacts with the Data Collection Module (DCM) to initialize the system and retrieve data from the DCM. This document is intended to guide an inspector through the various functions of the IDM for the purpose of initializing and retrieving information once the system is operational. DOE

N86-14581# Mound Lab., Miamisburg, Ohio.
EFFECTS OF OPERATING ENVIRONMENT ON PERFORMANCE OF RADIOMETRIC CALORIMETERS
R. L. Mayer, II 1985 7 p Presented at the 26th Annual Meeting of the Institute of Nuclear Materials Management, Albuquerque, New Mexico, 21 Jul. 1985
(Contract DE-AC04-76DP-00053)
(DE85-016446; MLM-3285(OP); CONF-850765-27) Avail: NTIS HC A02/MF A01

An experimental program was conducted to assess the effects of changes in operating environment on calorimeter performance. An environmental chamber was used to permit bath temperature stability, room temperature stability, room humidity, and the humidity to which the calorimeter's sample chamber is exposed to be varied independently of one another. The resulting effects on the mean and standard deviation of the error for standard measurements were studied. The results of analysis indicated that the interaction of bath and room temperature stability has a significant effect on error standard deviation, while the humidity to which the sample chamber is exposed most significantly affects mean error. This information can be used as part of a measurement assurance program by checking the product of bath and room temperature stability for significant changes with each sample measurement, and by checking for major shifts in humidity to which the sample chamber is exposed. DOE

N86-14582# Oak Ridge National Lab., Tenn.
EXPERIMENTAL DETERMINATION OF VACUUM ULTRAVIOLET ABSORPTION COEFFICIENTS AND OSCILLATOR STRENGTHS BY A MULTIPHOTON METHOD
W. R. Ferrell, M. G. Payne, and W. R. Garrett 1985 8 p Presented at the Conference on Lasers and Electro-Optics, Baltimore, 21 May 1985
Avail: NTIS HC A02/MF A01

A new multiphoton technique involving phase-matched third harmonic generation has been used to determine oscillator strengths, absorption coefficients, and refractive indices in the vacuum ultraviolet spectral system. DOE

N86-14583# Physikalisch-Technische Bundesanstalt, Brunswick (West Germany). Abt. Mechanik.
CALIBRATION OF AN ULTRASONIC FLOWMETER AND INVESTIGATION OF ITS BEHAVIOR UNDER GIVEN MOUNTING CONDITIONS [KALIBRIERUNG EINES ULTRASCHALL-DURCHFLUSSMESSERS UND UNTERSUCHUNG SEINES VERHALTENS BEI BESTIMMTEN EINBAUVERHAELTNISSEN]
Hans-Georg Kalkhof and Walter Hajek Jan. 1985 25 p refs In GERMAN
(PTB-Me-66; ISSN-0341-6720) Avail: NTIS HC A02/MF A01

An ultrasonic flowmeter equipped with three movable detectors was calibrated on a water meter test stand and tested under mounting conditions similar to the definitive mounting in the primary cooling circuit of an experimental nuclear reactor. Measuring errors are found to be $< 0.5\%$. However, deviations $> 20\%$ are found

when the flowmeter is mounted behind parts distorting the velocity profile in tube, especially by angular momentum. These errors are significantly reduced by the introduction of a flow rectifier which has to be calibrated together with the flowmeter. The magnitude of the deviations between the three measured signals and the magnitude of the measuring signal deviations at constant flow are shown to be influenced by flow perturbations. The measuring signal differences can therefore only be determined during commissioning in the primary cooling circuit. Author (ESA)

N86-14584# Nationaal Inst. voor Kernfysica en Hoge Energiefysica, Amsterdam (Netherlands). Sectie-K.
A CALORIC OUTPUT METER [EEN CALORISCHE VERMOGENSMETER]
R. vanAs 1985 87 p refs In DUTCH
(LINO-123) Avail: NTIS HC A05/MF A01

Calorimeter for a klystron test facility was developed. The klystron high frequency power is dumped in a water cooled dummy load. Rise of water temperature and quantity of flowed water are converted into frequencies by a 2 Gyr measuring instrument. A microcomputer controls input and readout, on which the processed data are digitally displayed every 10 sec. Author (ESA)

N86-14414# Osaka Univ. (Japan). Dept. of Precision Engineering.
LDVS USING POLARIZATION-PRESERVING OPTICAL FIBERS FOR SIMULTANEOUS MEASUREMENT OF MULTIDIMENSIONAL VELOCITY COMPONENTS
Noboru Nakatani, Muneo Tokita, Takao Izumi, and Tomoharu Yamada *In its* Technology Reports of the Osaka University, Vol. 35, Nos. 1800-1818 Oct. 1985 p 261-268 refs (For primary document see N86-14405 05-31)
Avail: NTIS HC A09/MF A01

N86-14470*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
CONTROLLER AND INTERFACE MODULE FOR THE HIGH-SPEED DATA ACQUISITION SYSTEM CORRELATOR/ ACCUMULATOR
S. S. Brokl *In its* The Telecommunications and Data Acquisition Report 15 Nov. 1985 p 113-124 refs (For primary document see N86-14457 05-32)
Avail: NTIS HC A10/MF A01 CSCL 14B

N86-14474*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A WIDE-BAND, HIGH-RESOLUTION SPECTRUM ANALYZER
M. P. Quirk, H. C. Wilck, and M. J. Grimm *In its* The Telecommunications and Data Acquisition Report 15 Nov. 1985 p 180-190 refs (For primary document see N86-14457 05-32)
Avail: NTIS HC A10/MF A01 CSCL 14B

N86-14733# Deutscher Wetterdienst, Hamburg (West Germany).
MEASURING CHARACTERISTICS OF PYRANOMETERS [MESSEIGENSCHAFTEN VON PYRANOMETERN]
K. Dehne *In* Physik.-Tech. Bundesanstalt Solar Elements: Measuring Tech. and Physical Fundamentals Oct. 1984 p 63-89 refs In GERMAN (For primary document see N86-14728 05-44)
Avail: NTIS HC A13/MF A01

N86-14865# Joint Publications Research Service, Arlington, Va.
MINIATURE PIEZOELECTRIC TRANSDUCER WITH ELASTIC SHIELD FOR DYNAMIC STUDIES OF BIOLOGICAL OBJECTS
L. G. Simonov, G. A. Drobakhin, Yu. S. Ioffe, Yu. S. Safarov, and Ye. G. Talalayev *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) 25 Nov. 1985 p 112-115 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 81-82 (For primary document see N86-14848 05-51)
Avail: NTIS HC A07

36 LASERS AND MASERS

Includes parametric amplifiers.

N86-14585*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LASANT MATERIALS FOR BLACKBODY-PUMPED LASERS
R. J. DeYoung, ed. and Kwan-Yu Chen, ed. Sep. 1985 178 p refs Workshop held in Hampton, Va., 1-2 Aug. 1985
(NASA-TM-87616; NAS 1.15:87616) Avail: NTIS HC A09/MF A01 CSCL 20E

Blackbody-pumped solar lasers are proposed to convert sunlight into laser power to provide future space power and propulsion needs. There are two classes of blackbody-pumped lasers. The direct cavity-pumped system in which the lasant molecule is vibrationally excited by the absorption of blackbody radiation and laser, all within the blackbody cavity. The other system is the transfer blackbody-pumped laser in which an absorbing molecule is first excited within the blackbody cavity, then transferred into a laser cavity when an appropriate lasant molecule is mixed. Collisional transfer of vibrational excitation from the absorbing to the lasing molecule results in laser emission. A workshop was held at NASA Langley Research Center to investigate new lasant materials for both of these blackbody systems. Emphasis was placed on the physics of molecular systems which would be appropriate for blackbody-pumped lasers. For individual titles, see N86-14586 through N86-14595.

N86-14586*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
INTRODUCTION TO THE WORKSHOP ON LASANT MATERIALS FOR BLACKBODY PUMPED LASERS
E. J. Conway *In its* Lasant Materials for Blackbody-Pumped Lasers Sep. 1985 p 1-9 (For primary document see N86-14585 05-36)
Avail: NTIS HC A09/MF A01 CSCL 20E

The purpose of this workshop was to define new lasants and transfer gases for blackbody pumped lasers. The goal was to find gases with the correct energies and lifetimes for use as lasants and/or transfer gases. The more immediate goal of the participants was to suggest molecules, currently available, (or to be synthesized) which either satisfy criteria which was developed or which deserve further study because from limited information they seem to satisfy the criteria. Thus, the workshop was interested in the identification of molecules and the rational for suggesting them. There were two basic kinds of blackbody lasers to be discussed, the cavity laser and the transfer laser. The physics of optical absorption and laser emission was addressed. The physics of the transfer laser was discussed. Molecular energy transfer from one molecule to another was added to the concepts already involved in the cavity laser. The physics of the transfer gas and the transfer-lasant gas combinations was also discussed. Author

N86-14587*# Washington Univ., Seattle.
CAVITY BLACKBODY-PUMPD LASERS: PRESENT RESEARCH STATUS
Walter Christiansen *In* NASA. Langley Research Center Lasant Materials for Blackbody-Pumped Lasers Sep. 1985 p 10-27 (For primary document see N86-14585 05-36)
Avail: NTIS HC A09/MF A01 CSCL 20E

The basic concept for a blackbody cavity is given. A comparison between the direct solar-pumped laser efficiency and one which is indirectly pumped by a blackbody cavity shows that they are similar to a carnot cycle. The blackbody spectrum used to optically pump the lasant material is shown. Also shown is the physical principle behind the blackbody laser idea. An example of an infrared laser media is given. A system study was conducted to scale cavity blackbody pumped lasers to high output powers. E.R.

N86-14588*# Old Dominion Univ., Norfolk, Va. Dept. of Physics.
ANALYTICAL INVESTIGATION OF CAVITY BLACKBODY LASERS
W. L. Harries *In* NASA. Langley Research Center Lasant Materials

for Blackbody-Pumped Lasers Sep. 1985 p 28-47 (For primary document see N86-14585 05-36)
Avail: NTIS HC A09/MF A01 CSCL 20E

The characteristics of an ideal blackbody cavity lasant were outlined. The choice of an ideal lasant is a complex process depending on a large number of factors, including the choice of a cooling medium and a buffer gas. Planck's radiation law limits the power input per unit area into a CO2 blackbody cavity laser making the surface area for high powered lasers excessively large. It is suggested that an alternative application might be small 1 W lasers for communication and surveillance, because it would be easy to maintain the cavity temperatures in synchronous orbits where 72 minutes each day are spent in the Earth's shadow. Author

N86-14589*# Florida Univ., Gainesville. Dept. of Astronomy.
A REVIEW OF LASER-PUMPED INFRARED LASERS
Kwan-Yu Chen *In* NASA. Langley Research Center Lasant Materials for Blackbody-Pumped Lasers Sep. 1985 p 48-79 refs (For primary document see N86-14585 05-36)
Avail: NTIS HC A09/MF A01 CSCL 20E

The lasing mechanisms are reviewed of molecules that have demonstrated laser action in the laboratories with laser emissions in the spectral range from 3 to 35 microns. A list of lasants and laser mechanisms are defined. The pumping sources for these lasers are mainly infrared lasers; however, the case in which excitation of bromine atoms at 2.71 microns by a flashlamp as energy input is also included in the review. A conceptual drawing of lasing mechanisms is shown. Three pumping mechanisms are shown, the first being the direct-pumped system in which the lasant molecule absorbs the infrared radiation from pump laser directly, and it is excited into the upper laser level from the ground state. The second system is the indirect-pumped system where the infrared-pump laser first excites an absorbing molecule which stores its vibrational energy. Through collision this energy is transferred to the lasant molecule, populating the upper laser level. In the third system, i.e., in a Br2-CO2 mixture, a flashlamp replaces the infrared laser as the pump source for the absorbing molecule. Author

N86-14590*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LASANTS FOR TRANSFER BLACKBODY-PUMPED LASERS
R. J. DeYoung *In its* Lasant Materials for Blackbody-Pumped Lasers Sep. 1985 p 80-111 refs (For primary document see N86-14585 05-36)
Avail: NTIS HC A09/MF A01 CSCL 20E

The concept of transfer blackbody-pumped lasers is outlined, recent research results concerning these lasers are presented and the search for new lasant materials for transfer blackbody-pumped lasers is expanded. There are two basic concepts for the blackbody-pumped transfer laser which are schematically drawn. The first concept is called the translational heating concept, an example being N2:CO2. Here the blackbody cavity is heated to approximately 2000 K by collected sunlight in space. An absorbing molecule would come in contact with the blackbody walls thus coming into equilibrium with the blackbody temperature. An alternative concept shown is called the vibrational heating transfer laser. Here the absorbing molecule is not translationally heated. Energy is coupled to the molecule only by optical absorption creating a high density of vibrational states. Thus the gas temperature is near room temperature whereas the vibrational temperature comes into equilibrium with the blackbody temperature. Author

N86-14591*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ENERGY TRANSFER MECHANISMS BETWEEN MOLECULES
W. E. Meador *In its* Lasant Materials for Blackbody-Pumped Lasers Sep. 1985 p 112-123 (For primary document see N86-14585 05-36)
Avail: NTIS HC A09/MF A01 CSCL 20E

Reliable rate coefficients for energy transfer and relaxation phenomena are needed in order to do the theoretical modeling which is necessary for accomplishing the following objectives: understanding and justifying proposed laser systems, determining limitations, identifying control parameters, and scaling to space-power requirements. Modeling also establishes the criteria to be followed for lasant selection. Lack of knowledge of rate coefficients is invariably the biggest obstacle to successful modeling. Existing theoretical methods are discussed, sources of error are identified, and transfer laser criteria suggested by the theory are listed. The emphasis is on vibrational-vibrational (V-V) energy transfer caused by both short range and long range interactions between molecules. Special attention is given to the importance of near-resonant collisional and dipole-dipole transfer. A technique is proposed for significantly improving the theoretical predictions of rate coefficients. Author

N86-14592*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
VIBRATIONAL EXCITATION OF CO BY BLACKBODY RADIATION
L. Arriola and J. W. Wilson *In its* Lasant Materials for Blackbody-Pumped Lasers Sep. 1985 p 124-136 refs (For primary document see N86-14585 05-36)
Avail: NTIS HC A09/MF A01 CSCL 20E

Lasers excited by blackbody radiation are of interest for power beaming applications in space. In such a system sunlight is collected and focused into a blackbody cavity, heating it to approximately 2000 K. An appropriate absorbing molecule is vibrationally heated but not translationally heated when passed through the blackbody cavity. The vibrationally excited gas is then mixed with a lasant resulting in laser emission. The number density of CO molecules within a blackbody radiation field of a given temperature and pressure is calculated. Such calculations show the degree of excitation achievable, under ideal conditions, from blackbody pumping. Author

N86-14593*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A METHOD FOR ANALYSIS OF BLACKBODY DIATOMIC-TRIATOMIC LASERS
J. W. Wilson, K. Y. Chen, L. Arriola, and J. H. Heinbockel *In its* Lasant Materials for Blackbody-Pumped Lasers Sep. 1985 p 137-156 (For primary document see N86-14585 05-36)
Avail: NTIS HC A09/MF A01 CSCL 20E

A formalism is developed for analysis of performance of direct blackbody and blackbody transfer lasers. Application to the CO/CO2 system is made. Three cases are treated: (1) Photoexcited triatomic laser; (2) Photoexcited diatomic-triatomic laser; and (3) Photoexcited diatomic mixing triatomic laser. Each is treated in a transverse flow geometry as illustrated. It is seen from the analysis that the mixing laser configuration has many advantages in that CO can achieve high excitation densities so that high power can be achieved on a relatively small scale. Author

N86-14594*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
REPORT FROM THE CAVITY-LASER WORKING GROUP
Edmund J. Conway *In its* Lasant Materials for Blackbody-Pumped Lasers Sep. 1985 p 157-168 (For primary document see N86-14585 05-36)
Avail: NTIS HC A09/MF A01 CSCL 20E

From the Workshop, a Cavity-Laser Working Group was formed. The goal of this Cavity-Laser Working Group was to propose molecules which might be useful as lasants for blackbody cavity lasers. The approach was to (1) define some rules for the identification of molecules, (2) consider molecules presented at the Workshop and (3) identify additional molecules through the suggestions of attendees. Some evaluation was to be attempted for each molecule considered. A set of criteria was developed, however, sophisticated rules required detailed information which was not available for every molecule. The rules are listed and briefly discussed. Author

N86-14595*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
REPORT FROM THE TRANSFER-LASER WORKING GROUP
W. E. Meador *In its* Lasant Materials for Blackbody-Pumped Lasers Sep. 1985 p 169-171 (For primary document see N86-14585 05-36)
Avail: NTIS HC A09/MF A01 CSCL 20E

Light absorbing molecules and lasing molecules were discussed with regard to satisfying the following criteria for blackbody transfer lasers: (1) Good absorbers of blackbody radiation at 1500-2000 K; (2) Near resonant energy transfer from the absorbing gas to the lasant, provided not too many quantum number changes are required; (3) Dipole-dipole interactions for most efficient energy transfer; (4) Exothermic forward transfer reaction; (5) Polyatomic lasant molecules with at least two fundamental vibrational modes to ensure one or more states between the upper laser level and the ground state; (6) Polyatomic lasant molecules should not be so large or so complex that fast V-V relaxation occurs; (7) Metastable upper laser level for maintaining inversion, at least with respect to radiative and V-V decay; (8) Fast V-V into the upper laser level and out of the lower laser level; and (9) Lasing wavelengths less than 10.6 microns. Possible combinations of absorbers and lasants satisfying these criteria were discussed.
Author

N86-14596# Columbia Univ., New York. Dept. of Electrical Engineering.
INTERACTION OF UV-LASER RADIATION WITH MOLECULAR SURFACE FILMS Final Report, Mar. 1981 - Mar. 1985
R. M. Osgood, Jr. 1 Jul. 1985 20 p
(Contract DAAG29-82-K-0089)
(AD-A158359; CMSL-1; ARO-19150.13-PH) Avail: NTIS HC A02/MF A01 CSCL 20/5

The surface chemistry of Laser Photodeposition has been explored. The findings include the photodissociation physics of organometallics on surfaces and in the gas phase, and the first observation of surface enhanced chemistry. The general objective of this research project is to obtain a clear picture of the basic physics of laser-surface chemical interactions. In pursuit of this general objective, we examined the following specific tasks: (1) Demonstrate and understand laser-enhanced surface using both random and collective arrays of metal particles. The reaction will be by ultraviolet photodecomposition. (2) Measure and analyze the spectra of methylalkyls and ethylalkyls. Develop and understanding of the shift of the spectra when these molecules are absorbed on passive substrates. (3) Experimentally determine the mechanism for the ultraviolet-enhanced etching of semiconductors submerged in aqueous solution.
GRA

N86-14597# Iowa Univ., Iowa City.
ALKALI METAL DIFFUSE BAND LASER Annual Technical Report, 1 Jun. 1984 - 31 May 1985
W. C. Stwalley 15 Jul. 1985 12 p
(Grant AF-AFOSR-0178-84)
(AD-A159034; AFOSR-85-0736TR) Avail: NTIS HC A02/MF A01 CSCL 20/5

Progress is described on study of a new class of potential excimer lasers based on diffuse bands of the alkali metal vapors. In particular, it has been established that the violet diffuse bands of sodium vapor and the yellow diffuse bands of potassium vapor are each composed of overlapping singlet and triplet excimer emission continua of the diatomic molecule. The violet gain and low absorption loss previously found with laser optical pumping of sodium vapor have been confirmed and extended to yellow gain and low absorption loss in potassium vapor. Prospects for laser oscillation in the near future appear to be very good.
Author (GRA)

N86-14598# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
LASER GUIDANCE WITH TRIAD DETECTOR ARRAY STRAPDOWN SEEKER M.S. Thesis
N. Kasikcioglu Jun. 1985 151 p
(AD-A159215; AFIT/GE/ENG/85J-3) Avail: NTIS HC A08/MF A01 CSCL 17/7

The triad detector array strapdown seeker is designed to guide a bomb toward the target designated by a laser. The signal processor determines the error signals related to the error angles of the bomb body fixed X-axis from the target LOS. Error signals are employed as correction commands to the bomb control surfaces in order to keep the bomb in the target LOS. The complete system is simulated as a computer algorithm to evaluate the performance of the triad detector array strapdown seeker. The trajectory of the bomb is determined by the computer algorithm from the release point to the impact point. The results revealed that the triad detector array strapdown seeker provided pursuit guidance for nonmoving targets and achieved destruction.
Author (GRA)

N86-14599# California Univ., Santa Barbara. Quantum Inst.
FREE ELECTRON LASERS Final Technical Report, 1 Jul. 1984 - 28 Feb. 1985
W. B. Colson and A. M. Sessler Aug. 1985 58 p
(Contract N00014-81-K-0809)
(AD-A159497; TR-5) Avail: NTIS HC A04/MF A01 CSCL 20/5

This paper reviews the experimental and theoretical development of free electron lasers. There is a review of the types of accelerators driving FELs, the history of FELs, and the prospects for the future.
GRA

N86-14600# Los Alamos National Lab., N. Mex.
LONG-BASE FREE ELECTRON LASER RESONANT CAVITY
E. L. Miller, S. C. Bender, Q. D. Appert, A. C. Saxman, and T. A. Swann 1985 13 p Presented at the Southwest Conference on Optics, Albuquerque, N. Mex., 4 Mar. 1985
(Contract W-7405-eng-36)
(DE85-015668; LA-UR-85-2380; CONF-850345-31) Avail: NTIS HC A02/MF A01

A 65-meter resonant cavity has been constructed in order to experimentally determine the characteristics of long resonant cavities as would be required for a free electron laser (FEL). A version using normal incidence mirrors is reported here, and another that includes a grazing incidence mirror is forthcoming. Either version is designed to simulate a FEL operating at 0.5 micron wavelength and is near-concentric with a stability parameter of 0.98. Argon-ion plasmas tubes simulate the laser gain that would be provided by a wiggler in an actual FEL. The cavity was constructed on a seismic slab and air turbulence effects were reduced by surrounding the beam with helium in 6 in. diameter tubes. Alignment sensitivities are reported and compared to geometrical and diffraction predictions with good agreement.
DOE

N86-14601# Washington Univ., Seattle.
RESONANCE IN WEAKLY NONLINEAR SYSTEMS Progress Report, 1 Aug. 1984 - 31 Mar. 1985
J. Kevorkian 1985 82 p
(Contract DE-AT06-83ER-13121)
(DE85-015287; DOE/ER-13121/T1) Avail: NTIS HC A05/MF A01

Research is reported in these areas: adiabatic invariants intransient resonance, survey of results for systems with slowly varying parameters, and free-electron laser dynamics and instabilities.
DOE

N86-14602# Los Alamos National Lab., N. Mex.
INSTALLATION ALIGNMENT OF A MULTI-BEAM ICF TARGET ILLUMINATION SYSTEM
W. Bauke and D. B. Stahl 1985 8 p Presented at the Southwest Conference on Optics, Albuquerque, New Mexico, 4 Mar. 1985
(Contract W-7405-eng-36)
(DE85-015677; LA-UR-85-2351; CONF-850345-30) Avail: NTIS HC A02/MF A01

Target illumination systems for inertial confinement fusion (ICF) experiments require precise alignment of a multitude of mirrors, usually spherically arranged around the ICF target. The mechanical support structure for these mirrors generally consists of a large

space frame with many voids. This makes direct alignment or boresighting impossible, since alignment instruments and references cannot be placed at the coordinate centers representing the mirror arrays or focal points. Nevertheless, the structural members must be accurately aligned during the assembly phase, to provide the focusing precision required by the completed illumination system. This paper describes the techniques used to assemble and align the Antares Laser space frame where a total of 48 mirrors fold and focus 24 laser beams onto the ICF target, within a 7.3 meter space frame. The alignment procedures described use optical tooling and test techniques supplemented by surveying instruments and auxiliary devices, as required by the unique geometry of the space frame. DOE

N86-14603# Edgerton, Germeshausen and Grier, Inc., Goleta, Calif.
PICOSECOND SEMICONDUCTOR LASERS FOR CHARACTERIZING HIGH-SPEED IMAGE SHUTTERS
T. S. Pagano, F. J. Janson, G. J. Yates, and S. A. Jaramillo 1985 7 p Presented at the SPIE International Technology Symposium on Optical and Electro-optical Engineering, San Diego, Calif., 18 Aug. 1985 Prepared in cooperation with Los Alamos National Lab., N. Mex.
(Contract DE-AC08-83NV-10282)
(DE85-016567; EGG-10282-2062; CONF-850887-22) Avail: NTIS HC A02/MF A01

A portable system that utilizes solid state electronic timing circuits and a pulsed semiconductor laser for characterizing the optical gate sequence of high-speed image shutters, including microchannel-plate intensifier tubes (MCPTs), and silicon-intensifier target vidicons (SITVs), is described and compared to earlier methods of characterization. Gate sequences obtained using the systems and streak camera data of the semiconductor laser pulse are presented, with a brief discussion of the electronic delay timing and avalanche circuits used in the system. DOE

N86-14604# California Univ., Berkeley. Lawrence Berkeley Lab.
VIBRATIONAL PREDISSOCIATION SPECTROSCOPY OF HYDROGEN CLUSTER IONS
M. Okumura, L. Yeh, I., and Y. T. Lee Jun. 1985 11 p Presented at the 7th International Conference on Laser Spectroscopy, Maui, Hawaii, 24 Jun. 1985 Prepared in cooperation with California Univ., Berkeley
(Contract DE-AC03-76SF-00098)
(DE85-016629; LBL-19854; CONF-850605-3) Avail: NTIS HC A02/MF A01

The first infrared spectra of protonated hydrogen clusters in the gas phase have been observed. Predissociation spectra were taken with a tandem mass spectrometer: mass selected hydrogen cluster ions were irradiated inside a rf ion trap by a tunable infrared laser, and the fragment ions created by photodissociation of the clusters were mass selected and detected. Spectra for each product channel were measured by counting fragment ions as a function of laser frequency. Low resolution spectra ((DELTA) (NU) = 10 cm(-1)) in the region from 3800 cm(-1) to 4200 cm(-1) were observed for the ions H5(+), H7(+) and H9(+) at 3910 cm(-1), 3980 cm(-1), and 4020 cm(-1) respectively. A band was also observed for H5(+) at 3532 cm(-1). No rotational structure was resolved. The frequencies of the band maxima agree well with the frequencies predicted by previous ab initio calculations for the highest modes. DOE

N86-14605# Pacific Northwest Lab., Richland, Wash.
DUGWAY TEST GRID LIDAR PROJECT
D. W. Johnson and D. A. Leonard May 1985 4 p Presented at the Workshop on Remote Sensing for Chemical Defense, Myrtle Beach, South Carolina, 16 Apr. 1985 Prepared in cooperation with GTE Government Systems, Mountain View, Calif.
(Contract DE-AC06-76RL-01830)
(DE85-012443; PNL-SA-13143; CONF-8504142-1) Avail: NTIS HC A02/MF A01

The primary objective of this project is to design and build a differential absorption lidar (DIAL) system to support field tests involving chemical releases at Dugway Proving Grounds. The design goals are to create a system capable of + or - 10% accuracy measurements of agent or simulant concentrations of 0.1 to 500 mg/sub m. The desired spatial resolution is 2 m (radial, with respect to the chemical release point) and 20 m (azimuthal) with simultaneous temporal resolution of 10 sec or less over the entire plume. In addition, system performance should not be degraded significantly by the presence of dust, munitions by-products, obscurants, and other interferents. The current conceptual design calls for a pair of 100 pulse/sec, 100 mJ/pulse CO2 lasers with computer-controlled frequency agility and scanning capability. The receiving optics have not been precisely specified, but will likely be 30 to 40 cm in diameter. Direct detection and digitization of the returned waveforms at 12-bit accuracy or better is also planned. Soft targets (wire screen in an open frame) are being considered for the test grid. DOE

N86-14606# Karlsruhe Univ. (West Germany). Sonderforschungsbereich 210.
LIGHT GUIDE PROBE FOR THE GENERATION OF LASER BEAM INTERSECTION IMAGES [LICHTLEITERSONDEN ZUR ERZEUGUNG VON LASERSTRAHLSCHNITTBILDERN]
F. Schmitt and B. Ruck Dec. 1984 35 p refs In GERMAN Original contains color illustrations
(KU-SFB-210/ET/7) Avail: NTIS HC A03/MF A01

The development and production of a universally usable probe for the generation of laser beam intersection images for flow visualization investigations are described. The application of light guides between laser and probe makes the system highly flexible in use and handling. The in and outcoupling of the laser radiation as well as the transmission characteristics of the gradient index fiber are discussed. The light power transmission is optimized by paying attention to laser beam coupling laws. The use of aspheric imaging lenses (cylindrical lenses) makes it possible to obtain light disks with defined dimensions. The optical calculation fundamentals required to that end, and an example of the design of a light guide probe with variable application possibilities are explained. The example of the visualization of a wind tunnel flow is given.
Author (ESA)

N86-14408# Osaka Univ. (Japan). Course of Electromagnetic Energy Engineering.
TWO DIMENSIONAL ANALYSIS OF ROD-TYPE LASER AMPLIFIER: SIMULATION CODE DEVELOPMENT
Tadash Yamada, Tadashi Kanabe, Masahiro Nakatsuka, Yoshiaki Kato, and Chiyoe Yamanaka *In its* Technology Reports of the Osaka University, Vol. 35, Nos. 1800-1818 Oct. 1985 p 213-220 refs (For primary document see N86-14405 05-31)
Avail: NTIS HC A09/MF A01

N86-14412# Osaka Univ. (Japan). Course of Electromagnetic Energy Engineering.
PARAMETRIC STUDY ON OPTICALLY-PUMPED 385-MICRONS D2O LASER SYSTEM FOR PLASMA DIAGNOSTICS
Yo Ichikawa, Ludong Wu, Yoshiaki Tsunawaki (Osaka Industrial Univ.), Masanobu Yamanaka, Shigeaki Okajima (Chubu Univ.), Toshikatsu Iwasaki (Osaka Electro Communication Univ.), Tatsuhiko Yamanaka, and Chiyoe Yamanaka *In its* Technology Reports of the Osaka University, Vol. 35, Nos. 1800-1818 Oct. 1985 p 245-253 refs (For primary document see N86-14405 05-31)
Avail: NTIS HC A09/MF A01

N86-14434# Joint Publications Research Service, Arlington, Va.
LASER ACTIVE COLOR CENTERS STUDIES
You Lu, Li Ping, Li Shenghua, Fang Shugan, He Shaoqi, and Wang Kuihua *In its* China Report: Science and Technology (JPRS-CST-85-027) 22 Aug. 1985 p 90-98 refs Transl. into ENGLISH from Zhongguo Jiguang (Shanghai), v. 12, no. 1, 20 Jan. 1985 p 15-19 (For primary document see N86-14433 05-31)
Avail: NTIS HC A09/MF A01

N86-14441# Joint Publications Research Service, Arlington, Va.
DUAL-FREQUENCY LASER ENERGY CENTER TEST INSTRUMENTS

Caiting Fu, Linbao Tang, and Dingyu Fei *In its* China Report: Science and Technology (JPRS-CST-85-033) 30 Sep. 1985 p 77-89 ref Transl. into ENGLISH from Dianzi Jishu Yingyong (Beijing), no. 12, 25 Dec. 1984 p 12, 13-17 (For primary document see N86-14438 05-31)
Avail: NTIS HC A06/MF A01

N86-14447# Joint Publications Research Service, Arlington, Va.
THEORETICAL CALCULATION OF PULSED ACTIVE-PASSIVE MODE-LOCKED SOLID STATE LASERS, PART 1
Zhenghe Zhu *In its* China Report: Science and Technology (JPRS-CST-85-036) 23 Oct. 1985 p 49-58 refs Transl. into ENGLISH from Wuli Xuebao (Beijing), v. 34, no. 5, May 1985 p 603-610 (For primary document see N86-14443 05-31)
Avail: NTIS HC A07/MF A01

N86-14448# Joint Publications Research Service, Arlington, Va.
THEORETICAL CALCULATION OF PULSED ACTIVE-PASSIVE MODE-LOCKED SOLID STATE LASERS, PART 2
In its China Report: Science and Technology (JPRS-CST-85-036) 23 Oct. 1985 p 59-71 refs Transl. into ENGLISH from Wuli Xuebao (Beijing), v. 34, no. 5, May 1985 p 610-621 (For primary document see N86-14443 05-31)
Avail: NTIS HC A07/MF A01

N86-14455# Joint Publications Research Service, Arlington, Va.
RTM OF ITALY APPLIES POWER LASERS TO WELDING, HARDENING
Andre Larane *In its* West Europe Report: Science and Technology (JPRS-WST-85-026) 4 Sep. 1985 p 12-15 Transl. into ENGLISH from Industries and Techniques (Paris), 20 Mar. 1985 p 35-37 (For primary document see N86-14454 05-31)
Avail: NTIS HC A04/MF A01

N86-14563# Verein Deutscher Ingenieure, Duesseldorf (West Germany).
LASER INTERFEROMETRIC LINEAR MEASURING TECHNIQUES
Hans-H. Schuessler *In* Verein Deutscher Ingenieure Measuring Methods Using Optoelectronic Semiconductor Components 1985 p 111-133 refs In GERMAN (For primary document see N86-14556 05-35)
Avail: NTIS HC A12/MF A01

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N86-14607# Rockwell International Corp., Golden, Colo.
REMOTE ENGINEERING Progress Report, Jan. - Dec. 1983
Charles M. Brown and C. A. Deitesfeld, ed. 22 Feb. 1985 46 p (Contract DE-AC04-76DP-03533)
(FRP-3694; DOE/TIC-4500-Rev-73) Avail: NTIS HC A03/MF A01

Progress in the Remote Engineering group's work of Rocky Flats from January to December 1983 is summarized. Remote Engineering's goals in all 1983 projects were to help increase production capacity and reduce radiation exposure. To convert hands-on operations to remote operations, Remote Engineering provided design, fabrication, and assembly of new equipment for varied Plant operations. Knowledgeable of robot manufacturers, the group's engineers also supervised bid solicitations for projects that could use off-the-shelf robots. Seventeen separate projects were handled by Remote Engineering in 1983. Four of the projects automate related operations in Building 559, the Chemical Analytical Laboratory. In Building 559, the following operations needed mechanizing: plutonium oxide pelletizing; sample cutting; storage, transfer, and retrieval; and emission spectrometer work. The majority of Remote Engineering's work concerned remoting diverse systems for production application. These systems included the molten salt button breakout operation; part serialization processes for three buildings; americium recovery; photosensitive liquid coating device; part brushing; plutonium oxide/skull burn and reburn; the W-79 remote assembly machine; site return compactor; filter probe positioner; and an unimate robot to replace the obsolete robot in the building 883 forging operation. Author

N86-14608# Joint Publications Research Service, Arlington, Va.
EAST EUROPE REPORT: SCIENCE AND TECHNOLOGY
18 Nov. 1985 86 p refs Transl. into ENGLISH from various East European articles
(JPRS-ESA-85-034) Avail: NTIS HC A05/MF A01

Progress in East European science and technology is reported. Topics discussed include: nuclear research, robotics, computer aided design and manufacturing, and computerized production. For individual titles, see N86-14609 through N86-14611.

N86-14609# Joint Publications Research Service, Arlington, Va.
RESEARCH CENTER DIRECTOR ASSESSES ROBOTICS TECHNOLOGY PROGRESS
Peter Ulrich *In its* East Europe Report: Science and Technology (JPRS-ESA-85-034) 18 Nov. 1985 p 15-17 Transl. into ENGLISH from Presse-Informationen (East Berlin), no. 56, 17 May 1985 p 3-4 (For primary document see N86-14608 05-37)
Avail: NTIS HC A05/MF A01

Robotics technology and its application is discussed. The robots employed primarily in the autonomous manipulation of tools, workpieces and materials and have proven to be useful in welding, painting and feeding machines, and industrial furnaces. On the scale of the entire economy and in many combines and factories much was accomplished and is accomplished to create the technology which is so important for improving employee's working and living conditions. Robotics proves to be a catalyst in the introduction of new technologies on the road toward moderization of existing physical plants. E.A.K.

N86-14610# Joint Publications Research Service, Arlington, Va.
CAD/CAM SYSTEMS FOR IC DEVELOPMENT, MANUFACTURE
Horst Eischner, Albrecht Moeschwitzer, and Albrecht Reibiger *In its* East Europe Report: Science and Technology (JPRS-ESA-85-034) 18 Nov. 1985 p 18-27 refs Transl. into ENGLISH from EDV-Aspekte (East Berlin), no. 2, 1985 p 52-55 (For primary document see N86-14608 05-37)
Avail: NTIS HC A05/MF A01

Highly developed computer-aided processes which are needed for the development of basic technologies, and for the designing and manufacturing of modern ICs are examined. Selected program systems which were developed by application to electronic circuits are introduced. The classification of the computer-aided methods which are of particular importance at the research and development stage and also in the planning and implementation of the manufacturing process are reviewed. Characteristic of CAD/CAM microelectronic systems are the extremely stringent requirements in terms of computer technology and the processes to be used. In process and component simulation, nonlinear partial differential equation systems for complicated local two and three-dimensional problems must be solved often in dynamic simulation. E.A.K.

N86-14611# Joint Publications Research Service, Arlington, Va.
IMPLEMENTATION OF COMPUTER-AIDED PRODUCTION SYSTEMS DETAILED
G. Zemann *In its* East Europe Report: Science and Technology (JPRS-ESA-85-034) 18 Nov. 1985 p 34-40 Transl. into ENGLISH from Fertigungstechnik und Betrieb (East Berlin), v. 35, no. 6, 1985 p 329-331 (For primary document see N86-14608 05-37)
Avail: NTIS HC A05/MF A01

Metal-forming combine technique, the material and technical basis of prouction was continually expanded and modernized. Today nearly every fifth machine tool involved in primary production is an numerical control(NC) or computer numerical control (CNC) machine. Complex, automated technological solutions, e.g., the cutting and precise machining of flat plate-type components in the production of large welded machine assemblies, can be

compared with corresponding technologies of any manufacturer in this branch of industry. The software packages developed during the past 15 years, cover many different areas of application, such as graphics capability for design-related and technological problems, data base systems for managing technical source data, interactive work station for complex planning and balance sheet models, process data systems for production control problems and many more. Since the first electronic data processing systems were introduced at the end of the 1960's production volume has increased five times. Two generations of metal-forming machines are added in the meantime. E.A.K.

N86-14612*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
GEARING
John J. Coy (Army Aviation Research and Technology Activity, Cleveland, Ohio), Dennis P. Townsend, and Erwin V. Zaretsky Dec. 1985 70 p refs
(NASA-RP-1152; E-2003; NAS 1.61:1152; AVSCOM-TR-84-C-15) Avail: NTIS HC A04/MF A01 CSCL 13I

Gearing technology in its modern form has a history of only 100 years. However, the earliest form of gearing can probably be traced back to fourth century B.C. Greece. Current gear practice and recent advances in the technology are drawn together. The history of gearing is reviewed briefly in the Introduction. Subsequent sections describe types of gearing and their geometry, processing, and manufacture. Both conventional and more recent methods of determining gear stress and deflections are considered. The subjects of life prediction and lubrication are additions to the literature. New and more complete methods of power loss predictions as well as an optimum design of spur gear meshes are described. Conventional and new types of power transmission systems are presented. Author

N86-14613*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PHENOMENOLOGICAL STUDY OF THE BEHAVIOR OF SOME SILICA FORMERS IN A HIGH VELOCITY JET FUEL BURNER
J. D. Cawley and R. F. Handschuh Oct. 1985 26 p refs
(NASA-TM-87127; E-2711; NAS 1.15:87127; USAAVSCOM-TR-85-C-17) Avail: NTIS HC A03/MF A01 CSCL 13I

Samples of four silica formers: single crystal SiC, sintered alpha-SiC, reaction sintered Si3N4 and polycrystalline MoSi2, were subjected to a Mach 1 jet fuel burner for 1 hr, at a sample temperature of 1375 deg C (2500 deg F). Two phenomena were identified which may be deleterious to a gas turbine application of these materials. The glass layer formed on the MoSi2 deformed appreciably under the aerodynamic load. A scale developed on the samples of the other materials which consisted of particular matter from the gas stream entrapped in a SiO2 matrix. Author

N86-14614# Department of the Army, Washington, D. C.
COMPACT BRAKE STRUCTURE Patent Application
E. FGeppert, inventor (to Army) Filed 22 Jan. 1985 7 p
(AD-D011809; US-Patent-Appl-SN-692955) Avail: NTIS HC A02/MF A01 CSCL 13/7

In one aspect, this patent application is related to a brake system. In a further aspect, this invention relates to braking systems for use with rotating shafts. A wide variety of various braking structures have been proposed. Examples include clutch packs with discs having one set of discs attached to a housing and a second interleaved set of discs attached to a rotating shaft, so that the discs can be forced together to stop the shafts rotation. Another suitable brake structure is a drum brake structure with shoes mounted on the rotating shaft which can be expanded to contact the drum and stop the shaft. The prior art systems in their various embodiments have proved useful. Such systems are particularly good in environments where a large brake structure can be mounted. However, for some applications, a small brake with a high effective braking force would be desirable. This invention has a driven rotary shaft mounted within a housing which is rigidly affixed to a base number. A plurality of annular U-shaped braking members are disposed within the housing and coaxially about the rotatary shaft. A force applicator is associated with the braking members and can apply an axial force to deform them. The axial force causes a deformation in the braking members which brings a portion of the outer edge of the braking members into contact with the interior of the housing. The inner portions of the braking members are simultaneously brought into contact with the outer surface of the shaft to apply a braking force. GRA

N86-14615# Systems Technology, Inc., Hawthorne, Calif.
METHODOLOGIES FOR THE DIRECT DIGITAL CONTROL OF HIGHLY FLEXIBLE VEHICLES Final Report, Jul. 1982 - Sep. 1984
D. McRuer, R. F. Whitbeck, and R. E. Magdaleno Feb. 1985 146 p
(Contract F33615-82-C-3614)
(AD-A158448; STI-TR-1193-1; AFWAL-TR-84-3104) Avail: NTIS HC A07/MF A01 CSCL 01/3

This report presents methodologies for the direct digital control of vehicles with flexible modes. The techniques yield robust control system designs with modest or minimal requirements on the number of sensors and control actuators. The digital system techniques used include primarily the w-transforms for direct design and stability assessment, and the hybrid frequency response, for assessment and understanding of digital system peculiarities. The sawtooth Bode is used as the basic control system design concept. These three elements are applied to several examples, including a comprehensive case study for a fighter aircraft flight and flexible mode control system. Both continuous and discrete system designs are considered and the continuous system characteristics are contrasted with an optimal control design. This comparison pinpoints some of the features needed to make optimal control procedures more practical and mature for flexible vehicle control applications. An important step is taken in this direction by determining the nature of performance criteria which yield, for an example case, a highly robust, extremely simple controller derived from an optimal control procedure. GRA

N86-14616# Army Test and Evaluation Command, Aberdeen Proving Ground, Md.
COLD REGIONS LOGISTIC SUPPORTABILITY TESTING OF CONSTRUCTION, SUPPORT AND SERVICE EQUIPMENT Final Report
25 Jun. 1985 29 p
(AD-A158714; TOP-9-4-006) Avail: NTIS HC A03/MF A01 CSCL 15/5

This document describes methods and techniques necessary to perform a logistic supportability test of construction, support and services equipment in a cold region environment. GRA

N86-14617# Texas A&M Univ., College Station.
MICRO-COMPUTER BASED DYNAMIC ANALYSIS OF LINEAR UNDAMPED PLANE FRAME STRUCTURES M.S. Thesis
L. Goshorn Aug. 1985 71 p
(Contract N66314-73-A-2112)
(AD-A158902) Avail: NTIS HC A04/MF A01 CSCL 13/13

This paper presents an assimilation of mathematical models and solutions needed in order to develop computer based analysis of dynamic structures. Using the variational formulation and a direct integration technique, a dynamic finite element model is developed. Modal analysis of unknown displacements of the structure, and the dynamic reduction of the structure are presented as alternative solutions. A system of micro-computer based programs which apply the presented solution techniques is described. The system of programs support varying cross sections of frame members, application of static, harmonic and non-harmonic loading conditions, and node displacements in the form of uniform base motion or independent node movement.
Author (GRA)

N86-14618# Department of the Army, Washington, D. C.
CABLE STRIPPING APPARATUS Patent Application
J. Ishmael, inventor (to Army) Filed 9 Aug. 1985 14 p

(AD-D011864; US-Patent-Appl-SN-763860) Avail: NTIS HC A02/MF A01 CSCL 09/1

This tool permits rapid and easy stripping of the outer insulation from coaxial cables or the like. The end of the cable to be stripped is first inserted into a gauging hole in a block of insulating material. A pair of blade-shaped electrical heating elements are clamped against opposite sides of the cable at the mouth of the hole and the cable rotated to form a thermal circumferential cut in the outer insulation. The cable end is then placed in another jig with a V-shaped groove therein and a blade-shaped heating element at the bottom of the groove. A second similar heating element is arranged above the groove and the cable. These two heating elements produce diametrically opposed longitudinal cuts in the insulation, after which two pieces of the insulation can be easily removed. GRA

N86-14619# Du Pont de Nemours (E. I.) and Co., Aiken, S.C.
MOBILE TELEOPERATOR RESEARCH AT SAVANNAH RIVER LABORATORY
J. S. Byrd 1985 12 p Presented at the Workshop on Requirements of Mobile Teleoperators for Radiological Emergency Response and Recovery, Dallas, Texas, 23 Jun. 1985
(Contract DE-AC09-76SR-00001)
(DE85-015826; DP-MS-85-60; CONF-8506148-4) Avail: NTIS HC A02/MF A01

A Robotics Technology Group was organized at Savannah River Laboratory to employ modern automation and robotics for applications at the Savannah River site. Several industrial robots have been installed in plant processes. Other robotics systems are under development in the laboratories, including mobile teleoperators for general remote tasks and emergency response operations. This paper discusses present work on a low-cost wheeled mobile vehicle, a modular light duty manipulator arm, a large gantry telerobot system, and a high technology six-legged walking robot with a teleoperated arm. DOE

N86-14620# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
WELD ENERGY REDUCTION BY USING CONCURRENT NON-DESTRUCTIVE EVALUATION Final Report
J. A. Johnson, N. M. Carlson, and A. D. Watkins May 1985 58 p refs
(Contract DE-AC07-76ID-01570)
(DE85-017472; EGG-MS-6843) Avail: NTIS HC A04/MF A01

In-process inspection of partially completed welds is shown to be feasible and to have the potential of large economic and productivity improvements in certain circumstances. Ultrasonic inspection of the weld and analysis by an automatic pattern-recognition system has a flaw detection rate of 90 to 95% with a false call rate of about 8%. The pattern-recognition system uses cues that human observers use to discriminate between good and flawed weld. The system has the potential to discriminate among types of flaws. An application analysis shows a potential savings of over $21 per foot of weld on two in. thick plates such as those used for pressure vessel fabrication. DOE

N86-14621# Los Alamos National Lab., N. Mex.
LINKED STATE MACHINES: SPEED INDEPENDENT DESIGN
H. K. Knudsen Apr. 1985 16 p refs
(Contract W-7405-eng-36)
(DE85-016216; LA-10400-MS-Vol-4) Avail: NTIS HC A02/MF A01

Necessary and sufficient conditions are developed for the speed independent operation of a linked state machine (LSM) that consists of one elementary state machine (ESM). Sufficient conditions for the speed independent operation of an LSM that consists of two ESMs are also developed. Any LSM that consists of one ESM is characterized by its digraph in which each vertex corresponds to an LSM state, and each edge corresponds to a state-of-state transition. An LSM is defined to be speed independent if there exists no vertex in its digraph from which paths lead to distinct sinks. A sink of a digraph is a strongly connected subgraph from which no arc is directed outward. The rationale behind speed independent design of LSMs is to allow nondeterministic behavior in which the ESMs that comprise the LSM can have concurrent operation and in which the ESMs reach, from each initial state, a corresponding set of final states (a sink). DOE

N86-14622# Mound Lab., Miamisburg, Ohio.
MOUND POWDER LOADER, MOD 1
A. V. Gress, Jr. 21 Aug. 1985 28 p
(Contract DE-AC04-76DP-00053)
(DE85-017384; MLM-MU-85-68-0002) Avail: NTIS HC A03/MF A01

At the investigation of Sandia Albuquerque, a semiautomatic powder loader was designed and fabricated for pyrotechnics devices. The basic functions of the system were to load a precise, measured amount of powder into a charge holder and to compact the mixture to a specified density. This report documents the history, rationale, design, and performance of the Mod 1 loader. DOE

N86-14623# Argonne National Lab., Ill.
AVOIDING LEAKAGE FLOW-INDUCED VIBRATION BY A TUBE-IN-TUBE SLIP JOINT
T. M. Mulcahy 1985 33 p Presented at the ASME Vibration and Sound Conference, Cincinnati, Ohio, 10 Sep. 1985
(Contract W-31-109-eng-38)
(DE85-006228; CONF-850926-2) Avail: NTIS HC A03/MF A01

Parameters and operating conditions for which a specific slip-joint design did not cause self-excited lateral vibration of the two cantilevered, telescoping tubes forming the joint were determined. The joint design featured a localized annular constriction. Flowrate, modal damping, tube engagement length, and eccentric positioning were among the parameters tested. Interestingly, all self-excited vibrations could be avoided by following a simple design rule: place constrictions only at the downstream end of the annual region between the tubes. Also, overall modal damping decreased with increased flowrate, at least initially, for upstream constrictions while the damping increased for downstream constrictions. DOE

N86-14624# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
SPOT WELD PARAMETER DEVELOPMENT FOR JOINING THIN SHEATH TO PLATE USING THE GAS METAL ARC WELDING PROCESS
A. D. Watkins Jun. 1985 34 p
(Contract DE-AC07-76ID-01570)
(DE85-017494; EGG-MS-6872) Avail: NTIS HC A03/MF A01

The gas metal arc welding process was shown to be a viable substitute for riveting in attaching thin sheaths to relatively thick plate. Welding process parameters were developed and characterized. Different material coatings at the sheath-to-plate interface are investigated with respect to their affect on the integrity of the spot weld. DOE

N86-14625# Centre Technique des Industries Mecaniques, Senlis (France). Dept. Calcul.
STUDY OF A COMPATIBLE STRUCTURAL DESIGN SYSTEM Final Report [ETUDE D'UN SYSTEME COMPATIBLE DE CALCUL DES STRUCTURES]
Michel Dubois, Mansour Afzali, Etienne Atger (ENSTIMA), and Alain Gevaudan (ENSTIMA) Aug. 1984 92 p refs In FRENCH
(Contract DGRST-81-S-0658)
(CETIM-11-A-233) Avail: NTIS HC A05/MF A01

The extension to three dimensions of a finite element procedure to compute elastic structures under two dimensional stress-strain is presented. The equations used to introduce the three dimensional element in a standard CASTOR program are detailed. The procedure is especially conceived for the design of thin shells. Numerical examples and the study of the influence of different parameters in the design of a shell are included. Author (ESA)

N86-14626# Centre Technique des Industries Mecaniques, Senlis (France).
TEST OF HYDRAULIC PISTONS, ISO 160 BARS Final Report [ESSAIS DE VERINS HYDRAULIQUES ISO 160 BARS]

J. L. Lanier Oct. 1984 30 p In FRENCH
(CETIM-14-J-301) Avail: NTIS HC A03/MF A01

A design of 160 bar pistons, following the ISO 6020 norm, is verified. Static and endurance tests were performed. Static measurements were done at 300 bars. At 300,000 cycles, pushing a mass of 1000 Kg, no wear is detected. In one of the cases a careful alignment is required to avoid creating spurious loads.
Author (ESA)

N86-14627# Centre Technique des Industries Mecaniques, Senlis (France).
DIMENSIONAL STABILITY OF SPRINGS Final Report [STABILITE DIMENSIONNELLE DES RESSORTS]
A. Niku-Lari Sep. 1984 158 p refs Partly in FRENCH and GERMAN
(CETIM-14-P-091) Avail: NTIS HC A08/MF A01

A theoretical graph procedure to determine the admissable load on cold formed springs is presented. The French norm NF-A43-301 and the German norm DIN2089 were utilized and the theoretical result was verified by experiments. Since the experiments show high dispersion, the proposed graphical determination is an approximation only. On average the theoretical values are lower than the experimental values. Author (ESA)

N86-14628# Centre Technique des Industries Mecaniques, Senlis (France).
HIGH TEMPERATURE DEFORMATION MEASURING TECHNIQUES Final Report [TECHNIQUES DE MESURES DE DEFORMATIONS HAUTES TEMPERATURES]
R. Buisson Feb. 1985 35 p In FRENCH
(CETIM-15-C-241) Avail: NTIS HC A03/MF A01

The application of strain gages above 60 C is explored. The temperature effects on the intrinsic properties of the components of strain gages are described. The difficulties observed in higher temperature measurements are discussed. The utilization of a compensation gage is analyzed. Installation techniques are examined. It is shown that the choice of a gage system depends on the temperature range. Capacitive gages may operate up to 850 C. Author (ESA)

N86-14629# Centre Technique des Industries Mecaniques, Senlis (France).
PREVISION OF THE EVOLUTION OF MODAL CHARACTERISTICS Final Report [PREVISION DE L'EVOLUTION DES CARACTERISTIQUES MODALES]
G. Lovat 20 Apr. 1984 48 p In FRENCH
(CETIM-15-E-171) Avail: NTIS HC A03/MF A01

The sensitivity analysis of mechanical structures (SAMS) program was tested on the HP5451B computer and in laboratory using a simple structure (a metallic tube with two 90 deg angles reinforced by a triangular metallic piece). Only vibration modes contained in the initial structure plane were considered. The analysis shows 4 vibration modes at frequencies of 154 to 1448 Hz. The experimental results differ by up to 100% from the computed results given by the SAMS program. These differences are discussed. Author (ESA)

N86-14630# Centre Technique des Industries Mecaniques, Nantes (France).
STUDY OF THE PROBLEMS CAUSED BY FUMES IN AUTOMATIC WELDING OPERATIONS, MIG OR MAG PROCEDURES Final Report [ETUDE DES PROBLEMES POSES PAR L'EMISSION DES FUMEES DE SOUDAGE EN PROCEDES SEMI-AUTOMATIQUES MIG OU MAG]
D. Beaufils (Institut de Soudure) 5 Jul. 1984 51 p refs In FRENCH
(Contracts CETIM-4-76-2693; CETIM-4-78-2476; CETIM-4-79-9266)
(CETIM-100-010; IS-15-945) Avail: NTIS HC A04/MF A01

A weld fume extraction system was developed. The aspiration chamber and glass fiber filter are described. The efficiency and reproducibility of the system are experimentally determined. The influence of welding parameters is explored. It is shown that the proposed method is convenient for the different types of welding systems explored. Author (ESA)

N86-14631# Centre Technique des Industries Mecaniques, Senlis (France).
AUTOMIZATION OF ULTRASONIC WELDING CONTROL Final Report [AUTOMATISATION DU CONTROLE PAR ULTRASONS DES SOUDURES]
Y. Pralus Aug. 1984 15 p refs In FRENCH
(CETIM-100-100) Avail: NTIS HC A02/MF A01

Automation of the welding quality control and the automation of data acquisition and data processing are described. The first problem is solved by water film coupling. For the second problem, each time that the echo is larger than a threshold, the data processing indicates the welding region, the transducer position at maximum echo and the value of this maximum. The computer program is described. Author (ESA)

N86-14632# Centre Technique des Industries Mecaniques, Nantes (France).
VERTICAL WELDING UNDER FLUX USING MELTING WIRE GUIDE Final Report [SOUDAGE VERTICAL SOUS LAITIER AVEC GUIDE FIL FUSIBLE]
D. Eliot (Institut de Soudre) 20 Feb. 1985 50 p In FRENCH
(Contract DGRST-83-1755)
(CETIM-100-190; IS-16-618) Avail: NTIS HC A03/MF A01

An automatic welding procedure for vertical weldings is described. The method allows high welding velocity and can be used by small shops. Recommendations on flux utilization, manufacturing of melting wire guides, welding parameters, welding procedures and inspection procedures are made. Examples and a cost analysis are included. Author (ESA)

N86-14633# Centre Technique des Industries Mecaniques, Senlis (France).
VALVES WITH A REDUCED MIXING ZONE Final Report [SOUPAPE A ZONE DE MELANGE REDUITE]
Michel Pluviose 15 Jan. 1985 33 p In FRENCH
(CETIM-101-470) Avail: NTIS HC A03/MF A01

A turbine valve piston to improve flow stability was designed. The device consists of an axisymmetric body with multiple teeth and cavities. Tests confirm better flow stability, a good mixing in a short distance, and the absence of flow rotation effects.
Author (ESA)

N86-14634# Centre Technique des Industries Mecaniques, Senlis (France).
APPROXIMATE DESIGN OF CYCLIC STRUCTURES Final Report [CALCUL APPROCHE DE STRUCTURES A SYMMETRIE CYCLIQUE]
Martine Volait Feb. 1985 110 p ref In FRENCH
(CETIM-102-030) Avail: NTIS HC A06/MF A01

A computation procedure taking into account the repetition cyclic characteristic of symmetric structures such as compressor rotors is presented. A finite element procedure is adopted and the computer program application is illustrated by the design of an electromagnetic brake wheel. The half rotor computation reduces computer time to one fourth. Author (ESA)

N86-14635# Centre Technique des Industries Mecaniques, Senlis (France).
PRELIMINARY STUDY OF A JOURNAL BEARING DYNAMIC TEST BENCH Final Report [AVANT PROJET BANC MESURES DYNAMIQUE DES PALIERS]
J. H. Batis Sep. 1984 113 p refs In FRENCH
(CETIM-102-120) Avail: NTIS HC A06/MF A01

A project to develop static and dynamic journal bearing test facilities to obtain the static data necessary to a complementary static model and to validate an existing dynamic computation model is outlined. The basic data and requirements of the test bench are presented. Technology, loading procedures, instrumentation, and auxiliary devices are discussed. Author (ESA)

N86-14636# Centre Technique des Industries Mecaniques, Senlis (France).
BORON NITRIDE: A NEW TOOL MATERIAL FOR LATHE OPERATIONS Final Report [LE NITRURE DE BORE: UN NOUVEAU MATERIAU D'OUTIL POUR LES OPERATIONS DE TOURNAGE]
J. P. Fantin 1 Feb. 1985 18 p In FRENCH
(CETIM-E-462-34) Avail: NTIS HC A02/MF A01

Bibliographic data, test data and customer comments were examined to assess the applications and performance of boron nitride for turning. The advantages of boron nitride are a hardness close to that of diamond, high temperature resistance and being chemically inert in contact with iron. Applications are given, and the limits imposed by its high cost are discussed. It is shown that boron nitride offers a possibility of productivity increase which is to be measured against the higher cost. Author (ESA)

N86-14637# Eidgenoessisches Flugzeugwerk, Emmen (Switzerland). Research and Testing Dept.
DESIGN AND PERFORMANCE CHARACTERISTICS OF A DRIVE SYSTEM FOR A RECIPROCATING COMPRESSOR OF A DYNAMIC COOLER TO BE USED IN SPACE Final Report
F. Berner, E. Nyfeler, H. Oesch, K. Goetz, L. Carenzo (Polymotor Italiana SpA), and P. Piazza (Polycontrol SpA) Paris ESA Jan. 1985 117 p refs
(Contract ESTEC-4684/81/NL-AK(SC))
(F+W-FO-1758; ESA-CR(P)-2051) Avail: NTIS HC A06/MF A01

The drive system of a one cylinder reciprocating compressor used in a dynamic cooling system based on a vapor compression cycle is described. The drive system consists of a brushless dc motor with its separate control module, and of a speed reduction gear with a planetary gear train. The torque varies between positive and negative values during each crankshaft revolution with absolute amounts up to four times the mean value. To keep the degree of nonuniformity of rotation within reasonable limits, a motor speed eight times that of the compressor was selected. The motor control is of the two-quadrant type whereby the motor functions as such when it has to provide a positive torque, and functions as a generator when it has to decelerate the rotating parts. To avoid oil lubrication problems under zero-g conditions, the speed reduction gear uses dry lubrication in the gear train. Author (ESA)

N86-14638# Technische Hogeschool, Delft (Netherlands). Dept. of Mechanical Engineering.
DYNAMICS OF SPATIAL MECHANISMS WITH FLEXIBLE LINKS
J. B. Jonker Dec. 1984 59 p refs Presented at 16th Theoretical and Applied Mechanics International Congression, Lingby, Denmark, Aug. 1984
(WTHD-171) Avail: NTIS HC A04/MF A01

A finite element procedure for the formulation of nonlinear differential equations of motion for spatial mechanisms with flexible links is presented. A (slider) truss element, (slider) beam element, and a hinge element are described. Methods for the calculation of transfer functions of multidegree of freedom mechanisms are presented. The theory is completed with the formulation of dynamics. Due to the approach with finite element notions, the method includes the description of the mechanical behavior of flexible link mechanisms. The equations derived are applicable to rigid link mechanism dynamics and to flexible link mechanisms as well. Author (ESA)

N86-14639# Technische Hogeschool, Delft (Netherlands). Abt. Maschinenbau.
SIMULATION OF THE DYNAMIC BEHAVIOR OF PLANAR MECHANISMS WITH TOLERANCE IN THE REVOLUTE JOINTS BY MEANS OF THE FINITE ELEMENT METHOD [SIMULATION DES DYNAMISCHEN VERHALTENS EBENER MECHANISMEN MIT SPIELBEHAFTETEN DREHGELENKEN MIT HILFE DER FINITE-ELEMENTE-METHODE]
B. Tanuwidjaja Apr. 1985 50 p refs
(WTHD-173) Avail: NTIS HC A03/MF A01

A finite element method based on the relation between position and deformation parameters combined with the principles of virtual work and d'Alembert is used to describe the impact of clearance on the kinematic and dynamic behavior of mechanisms. A simple clearance element is defined to describe planar revolute joints with clearance and added to an existing set of elements. As deformation and stress depends on material characteristics, a discontinuous force-deformation-relation is presumed. A high-speed crank-slider mechanism with clearance is analyzed with a computer program. Results show speed disturbances and violent acceleration disturbances. Author (ESA)

N86-14419# Yamaguchi Univ., Ube (Japan).
WEAR MECHANISM OF THE Si3N4 CERAMIC TOOLS IN CUTTING CAST IRON
Ryozo Kitagawa and Kitao Okusa *In its* Memoirs of the Faculty of Engineering, Yamaguchi University, Vol. 36, No. 1 Oct. 1985 p 1-7 refs In JAPANESE; ENGLISH summary (For primary document see N86-14418 05-31)
Avail: NTIS HC A09/MF A01

N86-14420# Yamaguchi Univ., Ube (Japan).
FUNDAMENTAL STUDY OF WAVE PHENOMENON IN THE EXHAUST PIPE OF AN INTERNAL COMBUSTION ENGINE
Haruo Izumi and Motokazu Fukuda *In its* Memoirs of the Faculty of Engineering, Yamaguchi University, Vol. 36, No. 1 Oct. 1985 p 9-16 refs In JAPANESE; ENGLISH summary (For primary document see N86-14418 05-31)
Avail: NTIS HC A09/MF A01

N86-14430# Yamaguchi Univ., Ube (Japan).
A MONITORING AND CONTROL SYSTEM FOR CUTTING TOOL'S DAMAGE BY ACOUSTIC EMISSION, PART 1
Itsuo Takanami, Masuo Yoshioka, Yoshiro Sakai, and Kazumi Kobayashi *In its* Memoirs of the Faculty of Engineering, Yamaguchi University, Vol. 36, No. 1 Oct. 1985 p 117-123 refs In JAPANESE; ENGLISH summary (For primary document see N86-14418 05-31)
Avail: NTIS HC A09/MF A01

N86-14446# Joint Publications Research Service, Arlington, Va.
DIFFERENTIAL CIRCUIT MODEL FOR TURBOMOLECULAR PUMP BLADE
Jiguo Chu and Yunlong Sun *In its* China Report: Science and Technology (JPRS-CST-85-036) 23 Oct. 1985 p 35-48 refs Transl. into ENGLISH from Zhenkong Kexue yu Jishu (Beijing), v. 4, no. 5, Sep. 1984 p 311-318, 334 (For primary document see N86-14443 05-31)
Avail: NTIS HC A07/MF A01

N86-14451# Joint Publications Research Service, Arlington, Va.
PRESENT, PROSPECTS OF COMPUTER CONTROLLED MANUFACTURING CELLS
Jozsef Hatvany, Matyas Horvath, and Janos Somlo *In its* East Europe Report: Science and Technology (JPRS-ESA-85-032) 28 Oct. 1985 p 48-57 Transl. into ENGLISH from Magyar Elektronika (Budapest), no. 1, 1985 p 42-47 (For primary document see N86-14450 05-31)
Avail: NTIS HC A05/MF A01

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N86-14640# Army Materials and Mechanics Research Center, Watertown, Mass.
RELIABILITY AND LIFE PREDICTION METHODOLOGY - M60 TORSION BARS Final Report
R. S. Barsoum, W. M. Bethony, R. H. Brockelman, H. P. Hatch, and C. F. Hickey, Jr. Jun. 1985 61 p
(AD-A159197; AMMRC-TR-85-18) Avail: NTIS HC A04/MF A01

CSCL 13/9

The life prediction and reliability assessment of the M60 tank torsion bars were obtained from applying a methodology involving several disciplines. The disciplines included: structural mechanics, fracture mechanics, statistical reliability, mechanical testing, nondestructive examination (NDE), quality assurance (QA), and metallurgical and fractographic evaluations. The methodology was applied in order to obtain a procedure for increasing torsion bar life and enhance the reliability of the M60 tank. U.S. Army reliability performance is commonly measured in mean miles between failures (MMBF). In order to introduce a more meaningful measure of component acceptability, this report describes methods for obtaining minimum life estimate at a specified probability of survival using the Monte Carlo process. This includes predicting remaining life with known risk and an approach to perform trade-off costs or redesign for increased life. The result is a more meaningful measure of component acceptability. The reliability versus bar life computation indicated a negligible amount of life after a bar flaw was initiated in the bar. The minimum life estimates prior to crack initiation were in good agreement with frequency of actual bar failures recorded at Aberdeen Proving Grounds. GRA

N86-14641# Centre Technique des Industries Mecaniques, St. Etienne (France).
INDUSTRIAL PROGRAMMABLE AUTOMATA METHODOLOGY OF CHOICE Final Report [METHODOLOGIE DE CHOIX D'UN API]
J. C. Boehm and G. Rouchouse Feb. 1985 118 p In FRENCH (CETIM-100-070) Avail: NTIS HC A06/MF A01

The specifications of programmable automata and choice criteria are studied. Commercial products since 1981 are classified following a specification system which is detailed. The choice procedure is described including a diagnosis, a primary choice following specified criteria, and a choice optimization based on product evaluations. Author (ESA)

N86-14642# Centre Technique des Industries Mecaniques, Senlis (France).
QUALITY CONTROL AND RECEPTION INSPECTION OF SYNCHRONOUS BELTS Final Report [CONTROLES ET ESSAIS DE RECEPTION DES COURROIES SYNCHRONES, NOUVEAUX ESSAIS]
R. Delcourt and L. Faure 12 Apr. 1985 34 p refs In FRENCH (CETIM-101-850) Avail: NTIS HC A03/MF A01

The reception measurement and inspection methods of toothed power belts are described. A generalized specification including geometrical controls, tooth profile, pitch, optical and magnetic methods, mechanical characteristics measurement, life tests, mounting load and performance tests is detailed. Author (ESA)

N86-14643# European Space Agency, Paris (France).
THE MANUAL SOLDERING OF HIGH-RELIABILITY ELECTRICAL CONNECTIONS
Mar. 1985 82 p
(ESA-PSS-01-708-ISSUE-1; ISSN-0379-4059) Avail: NTIS HC A05/MF A01

An ESA specification to ensure the high reliability of hand soldered electrical connections intended to withstand normal terrestrial conditions and the vibrational G-loads and environment imposed by space flight is presented. Tools, materials, and design are covered. Acceptance and rejection criteria are stated and workmanship standards are included to permit discrimination between proper and improper work. Author (ESA)

N86-14956# Harry Diamond Labs., Adelphi, Md.
CALCULATION OF LOWER CONFIDENCE BOUNDS ON SYSTEM RELIABILITY
J. V. Michalowicz *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 903-937 (For primary document see N86-14902 05-59)
(AD-P004957) Avail: NTIS HC A99/MF E03 CSCL 12/1

N86-15160*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
SELF-RENEWAL: A STRATEGY FOR QUALITY AND PRODUCTIVITY IMPROVEMENT
D. H. Hutchinson *In* NASA. Johnson (Lyndon B.) Space Center R and D Productivity: New Challenges for the US Space Program 1985 p 18-31 refs (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 14D

N86-15201*# Martin Marietta Aerospace, New Orleans, La.
QUALITY CIRCLES: ORGANIZATIONAL ADAPTATIONS, IMPROVEMENTS AND RESULTS
Ralph Tortorich *In* NASA. Johnson (Lyndon B.) Space Center R and D Productivity: New Challenges for the US Space Program 1985 p 490-494 ref (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 14D

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

N86-14644# Technical Univ. of Brno (Czechoslovakia).
DESIGN LIMIT STATES OF STEEL STRUCTURES: 1ST INTERNATIONAL CORRESPONDENCE CONFERENCE 1983/84, VOLUME 1
J. Melcher, ed. 1983 320 p refs In ENGLISH and RUSSIAN Conf. held in Czechosolvakia, 1983 2 Vol.
Copyright. Avail: Issuing Activity

The theme of the conference 'Design Limit States of Steel Structures', which took place in Brno (Czechoslovakia) in 1983/84, was reliability, and economy of materials, labor, and energy in the design and assembly of steel structures. An important factor constituting a precondition for the solution of these requirements is the development of the design method according to limit states. In a number of countries this method already has been incorporated into standardized instructions for designing steel structures. In others, it has been proposed as an alternative to be used along with classical design procedures. For individual titles, see N86-14645 through N86-14665.

N86-14645# Technical Univ. of Brno (Czechoslovakia).
DESIGN LIMIT STATES OF STEEL STRUCTURES: INTRODUCTION TO THE 1ST INTERNATIONAL CORRESPONDENCE CONFERENCE
Jindrich Melcher *In its* Design Limit States of Steel Structures: 1st International Correspondence conference 1983/84, Vol. 1 1985 p 27-40 refs (For primary document see N86-14644 05-39)
Avail: Issuing Activity

The methodology of designing steel construction according to design limit states is a real one and for practical purposes is based on a semiprobability conception of structural reliability of the first level. Knowledge about random behavior of constructions and stresses is not yet so perfect as to permit consequential application of a general probability theory of reliability in a practical design to support system. In the application of the method of limit states there are still confusion and different opinions from the point of view of basic definitions and terminology, and also from the point of view of continuity of the problems of stress, the response of the construction to stress, design models and dimensional proceedings. Author

N86-14646# Technical Univ. of Brno (Czechoslovakia).
LIMIT STATES AND THEIR DEFORMATION CRITERIA FOR THE DESIGN OF STEEL STRUCTURES
N. N. Streleckij *In its* Design Limit States of Steel Structures: 1st International Correspondence Conference 1983/84, Vol. 1 1985 p 41-9 In RUSSIAN; ENGLISH summary (For primary document see N86-14644 05-39)

Avail: Issuing Activity

The general analysis and characteristics of individual groups of limit states is discussed. Limit states are divided into those of strength and deformation. It is demonstrated that the deformation criteria are determined not only from the point of view of the serviceability limit state of the construction in normal operation, but they are a general progressive criterion of all types of limit states of steel constructions. The criterion of limiting plastic deformations is introduced, i.e. in the form of small plastic deformations (instead of the criteria of reaching the yield point) and by the form of developed plastic deformations (instead of the precondition of joint stress). There are also discussed the questions of total and local stability. Author

N86-14647# Technical Univ. of Brno (Czechoslovakia).
ON THE DEVELOPMENT OF THE METHOD OF LIMIT STATES IN THE FIELD OF METAL STRUCTURES
Irena Karnikova, Pavel Marek, Miros Pirner, Miroslav Skaloud, and Milik Tichy *In its* Design Limit States of Steel Structures: 1st International Correspondence Conference 1983/84, Vol. 1 1983 p 50-65 refs (For primary document see N86-14644 05-39)
Avail: Issuing Activity

The principle of the limit states method with regard to the theory of eliability is stressed. The basic starting preconditions are mentioned and the design process and estimation are analyzed up to the formulation of the conditions of reliability from the point of view of the ultimate limit states nd the serviceability limit states. Attention is also given to the separation of problems of loading action from the problems of the response of the structure to loading, and both theoretical and experimental models are used to demonstrate his. It is continued that first of all the so called first level of application of the theory of reliability, including the conscious application of plastic reserves must be fully mastered before the preconditions for the introduction of the methods of limit states based on a higher level of the theory of reliability are met. Author

N86-14648# Slovak Academy of Sciences, Bratislava (Czechoslovakia). Inst. of Construction and Architecture.
MRAZIK, AUGUSTIN
In Technical Univ. of Brno Design Limit States of Steel Structures: 1st International Correspondence Conference 1983/84, Vol. 1 1983 p 66-78 refs (For primary document see N86-14644 05-39)
Avail: Issuing Activity

The method of limit states was introduced in CSSR by the standards CSN 73 0031-1963 for general principles and CSN 73 1401-1968 for steel constructions. The standards agree with those of CMEA. A semiprobabilistic form of the method with partial reliability coefficients is used. There is a tendency to give the coefficients probabilistic definitions. The first step in the preparation of the standard was statistical investigation of the quality of steels (1956-59). The probabilistic definition of design strengths also permits the determination of the design strengths differentiated from the point of view of the consequences of defects and computation methods. It also permits expression of the influence of a combination of materials in the element of construction, and an approach to the results of the method of the second level.
Author

N86-14649# Technical Univ. of Brno (Czechoslovakia).
RELIABILITY CONDITION WITH RESPECT TO THE HIGH-CYCLE FATIGUE STRENGTH
Vlastimil Krupka, Pavel Marek (Sportovni Stavby, Praha, Czechoslovakia), and Milos Vlk *In its* Design Limit States of Steel Structures: 1st International Correspondence Conference 1983/84, Vol. 1 1983 p 79-87 refs (For primary document see N86-14644 05-39)
Avail: Issuing Activity

The principles of the method of limit states dealing with the condition of reliability of metal structures exposed to high-cycle fatigue are discussed. In an easy-to-survey method two basic problems are discussed: the history of loading (models serving the transformation of response loading), and the definition of minimum strength from the point of view of fatigue. Special attention is paid to the definition of design elements entering the condition of reliability. Problems in the evaluation of theoretically or experimentally determined element are pointed out, as well as their transformation to design elements. Author

N86-14650# Technical Univ. of Brno (Czechoslovakia).
THE CALCULATION OF LIFE-TIME OF STEEL STRUCTURES UNDER CYCLICAL LOADING WITH THE CONSIDERATION OF LAWS VALID FOR CRACKS SPREADING
V. S. Zoteev and J. A. Novikov *In its* Design Limit States of Steel Structures: 1st International Correspondence Conference 1983/84, Vol. 1 1983 p 88-94 refs In RUSSIAN; ENGLISH summary (For primary document see N86-14644 05-39)
Avail: Issuing Activity

Contemporary methods of calculation are used for steel structures for atigue from the existence of defects similar to cracks that propagate under cyclic loading. In real constructions there develop fatigue cracks whose laws differ from the knowledge of the mechanics of long crack fractures. Further investigation is necessary. In the paper the results of the investigation are described. Circular samples with sharp notches made of iron alloys are tested. The results shows that the velocity of crack propagation in relation to the number of loading cycles has three stages. The second and third stages are subjected to detailed investigation. The results are expressed mathematically. The coefficients of equations are discussed on the basis of experimental results.
Author

N86-14651# Harbin Civil Engineering Inst. (China).
PROBABILITY BASED DESIGN PROCEDURE OF STEEL STRUCTURES
Shi-Zhao Shen *In* Technical Univ. of Brno Design Limit States of Steel Structures: 1st International Correspondence Conference 1983/84, Vol. 1 1983 p 95-102 refs (For primary document see N86-14644 05-39)
Avail: Issuing Activity

The People's Republic of China is now designing steel structures by a probability method based on the linearized theory of the second moment. In the section about statistical characteristics of basic variables there are mentioned some numerical results of evaluation of the loading and bearing capacity of structures. The index of reliability is differentiated according to three classes of the purpose of constructions, and according to hardness or brittle fracture. Its values are derived by means of the present method of design. For practical design the computation formula using partial reliability coefficients is introducted. Some values of the coefficients are given. Author

N86-14652# Technical Univ. of Brno (Czechoslovakia).
SOME REMARKS TO THE DESIGN OF STRUCTURES
Frantisek Faltus *In its* Design Limit States of Steel Structures: 1st International Correspondence Conference 1983/84, Vol. 1 1985 p 103-105 (For primary document see N86-14644 05-39)
Avail: Issuing Activity

The principles of design of structures are summarized according to the method of allowable stresses, the application of loading coefficients and finally, according to the method of limit states. Attention is drawn to the necessary of making more exact the designing of constructions with the application of plasticity, i.e., by means of the introduction of the concept of plastic properties instead of the theoretical plastic joint. Higher attention must be also paid to computations for seams and joints. Author

N86-14653# Technical Univ. of Cracow (Poland). **c32**
ENTROPY IN RANDOM CAPACITY ESTIMATION
Alfred Sowa and Tomasz Domanski *In* Technical Univ. of Brno Design Limit States of Steel Structures: 1st International Correspondence Conference 1983/84, Vol. 1 1983 p 106-114 refs (For primary document see N86-14644 05-39)
Avail: Issuing Activity

Entropy as a measure of uncertainties is a term taken from information theory. It is applied as a measure of differences between two or more distributions, i.e., in the a priori model

based on laboratory results of a posteriori based on statistics of failures of constructions, or just one element and a construction. Entropy of an element and a construction is expressed by formula. Decision making by the perturbation method is used, after determining the capacity of a structure by meas of logarithmic-normal distribution and by the Weibull density function. Mututal interdependence of the probability a priori and a posteriori is investigated by the method of accumulation. Examples and discussion of error minimalization are given. Author

N86-14654# Technical Univ. of Brno (Czechoslovakia).
DETERMINATION OF CHARACTERISTIC AND DESIGN QUANTITIES IN DESIGNING CONSTRUCTIONS
J. Murzewski *In its* Design Limit States of Steel Structures: 1st International Correspondence Conference 1983/84, Vol. 1 1983 p 115-127 refs In RUSSIAN; ENGLISH summary (For primary document see N86-14644 05-39)
Avail: Issuing Activity

The determination of dimensional value according to measurement results is discussed. For the loading component, a series of random independent vortices of variable stresses is proposed. The procedure for 'a priori' and 'a posteriori' situations is differentiated. In the area of bearing capacity problems, simple and complex systems are distinguished. In the case of the former, there is the question of the determination of a minimum value of the weakest focus. It is demonstrated that the determination of characteristic values without regard to spatial and time measurement is not correct. A new conception of critical values based on the reliability of a model of combined series-parallel connections is presented. Critical values are interpreted as optimal computation values. Author

N86-14655# Technical Univ. of Brno (Czechoslovakia).
SECURING THE RELIABILITY OF BUILDNG METALLIC CONSTRUCTIONS IN INCREASING THE DESIGN STRENGTHS OF STEELS
V. I. Malyj *In its* Design Limit States of Steel Structures: 1st International Correspondence Conference 1983/84, Vol. 1 1983 p 128-136 refs In RUSSIAN; ENGLISH summary (For primary document see N86-14644 05-39)
Avail: Issuing Activity

The values of design strengths R in the Soviet standard of designing steel constructions were not revised from 1955 to 1981 due to the absence of a suitable methodological base. In the last revision of the standards the design strengths increased from 8% to 19%. Guaranteeing the reliability of construction under present conditions is discussed. The methodology of evaluation of the dependence of the number of failures from the values of design strengths is explained. The failures are divided into a first type with design strength and a second type due to major errors. By means of the analysis of individual influences it is determined that, while increasing the design strength, there does not exist any danger of a sudden increase of failures of the first type. Author

N86-14656# Technical Univ. of Brno (Czechoslovakia).
GEOMETRIC AND PHYSICAL IMPERFECTIONS OF ROD CONSTRUCTIONS AND THEIR INFLUENCE ON LIMIT STATES
G. A. Avtandilyan and V. S. Polyak *In its* Design Limit States of Steel Structures: 1st International Correspondence Conference 1983/84, Vol. 1 1983 p 137-144 refs In RUSSIAN; ENGLISH summary (For primary document see N86-14644 05-39)
Avail: Issuing Activity

The evaluation of possible technological imperfections (scatterings of area of cross sections, physical properties, lengths of elements and coordinates of nodes) of rod structures is discussed. Systematic collecting and evaluating of results of measuring is a endeavor but a difficult one. The analysis of statistical data is carried out. It is found that the scatterings are situated within the limits given by Soviety standards. For this reason the statistical parameters are estimated by means of standard deviations. For the determination of the influence of imperfections a computer program is prepared. Results of the movement of the support and mounting of radiotelescopes are presented. Author

N86-14657# Technical Univ. of Brno (Czechoslovakia).
ABOUT THE METHODOLOGY OF DETERMINATION OF SPECIFIED STRENGTH OF STEEL IN THEORY OF DESIGNING ACCORDING TO LIMIT STATES
A. Kvedaras *In its* Design Limit States of Steel Structures: 1st International Correspondence Conference 1983/84, Vol. 1 1983 p 145-153 refs In RUSSIAN; ENGLISH summary (For primary document see N86-14644 05-39)
Avail: Issuing Activity

The methodology of determination of specified steel strength in the theory of designing according to limit states is analyzed. The proposal is made to classify the steels according to the limit of ductility and other physical - mechanical properties with the application of the methods of nondestructive control of metals and products. It is also proposed to mention in the documents of the delivered steel products data about the size of its proportional limit. It is demonstrated that the proposals may contribute to a more rational and economic application of steel products in steel and composite constructions. Author

N86-14658# Technical Univ. of Warsaw (Poland).
INFLUENCE OF RANDOM VARIABILITY OF STEEL SHAPES CROSS-SECTION AREA ON DESIGN STRENGTH
Andrzej Kowalski and Wojciech Wlodarczyk *In* Technical Univ. of Brno Design Limit States of Steel Structures: 1st International Correspondence Conference 1983/84, Vol. 1 1983 p 154-161 refs (For primary document see N86-14644 05-39)
Avail: Issuing Activity

The design strength is influenced by random variability of mechanical and geometric features of transversal cross sections. The formula, where gamma sub 1 is the partial coefficient of the influence of mechanical properties, and gamma sub 2 is the influence of the change of geometric quantities is considered. Statistical features of the quantities being considered are given. The partial coefficient gamma sub 2 is considered the product of coefficients gamma sub 21 of the influence of the change of basic features of cross sections, gamma sub 22 of the influence of random eccentricity of loading of pulled and pressed rods, and gamma sub 23 of the influence of nonuniform corrosion in an aggressive environment. The values are determined according to formulas. Author

N86-14659# Technical Univ. of Brno (Czechoslovakia).
DEPENDENCE OF DESIGN STRENGTHS AND THE DEGREE OF SAFETY OF STEEL CONSTRUCTIONS ON THE LIMIT DEVIATIONS OF GEOMETRICAL QUANTITIES
G. Y. Estrin *In its* Design Limit States of Steel Structures: 1st International Correspondence Conference 1983/84, Vol. 1 1983 p 162-173 refs In RUSSIAN; ENGLISH summary (For primary document see N86-14644 05-39)
Avail: Issuing Activity

Contemporary technology permits the production of rolled profiles in the area of minus tolerances with a narrowed spread of dimension deviations. In this connection questions of reliability of individual types of rolled steels are analyzed in relation to prescribed standardized deviations (the properties of steel are considered determined values). It follows from the results of the analysis the requirement to introduce a linear dependence between the values of limit deviations and the thickness of the wall. In this way the design strengths and reliabiiity of all types of rolled profiles and tubes may be increased. Author

N86-14660# Naples Univ. (Italy). Istituto de Tecnica delle Costruzioni.
PLASTIC ANALYSIS OF HIGH-STRENGTH STEEL STRUCTURES
A. DeLuca, A. DeMartino, C. Faella, and F. M. Mazzolani *In* Technical Univ. of Brno Design Limit States of Steel Structures: 1st International Correspondence Conference 1983/84, Vol. 1 1983 p 174-182 refs (For primary document see N86-14644

05-39)
Avail: Issuing Activity

The classical plastic analysis of constructions used for soft steels is valid for the ideal Beta-Epsilon elastoplastic dependence. In constrast to soft steels, high strength steels have a distinct Beta-Epsilon relationship, resulting from significant material strength and intrinsic ductility. A solution considering the nonlinear Beta-Epsilon relationship with the application of the Ramberg-Osgood dependence in a failure mode is discussed. The results emphasize the need for the ductility of high-strength steels. Author

N86-14661# Technical Univ. of Prague (Czechoslovakia). Building Research Inst.
NONLINEAR ANALYSIS OF A LIMIT STATE OF STEEL STRUCTURES
Petr Broz *In* Technical Univ. of Brno Design Limit States of Steel Structures: 1st International Correspondence Conference 1983/84, Vol. 1 1983 p 183-190 (For primary document see N86-14644 05-39)
Avail: Issuing Activity

A formulation of nonlinear problems is expressed, by means of which construction limit states may be treated by the method of boundary integrals. Dimensional reduction is discussed, leading to the treatment of the general elastic body according to the von Karman equation. Boundary conditions respecting geometrical nonlinearity are also discussed. In the case of physical nonlinearity the method of boundary elements is of advantage in the application of a deformation variant when the material constants remain unchanged but the stress condition changes (i.e., the inclusion of internal stresses). In comparison with nonlinear elasticity, the dependence of plastic functions on the internal parameters of the problem is also investigated, nd the influence of the modulus of elasticity is analyzed. Author

N86-14662# Technical Univ. of Brno (Czechoslovakia).
PECULARITIES OF DESIGN OF PRECISE METALLIC CONSTRUCTIONS ACCORDING TO LIMIT STATES
V. S. Polyak *In its* Design Limit States of Steel Structures: 1st International Correspondence Conference 1983/84, Vol. 1 1983 p 191-201 refs In RUSSIAN; ENGLISH summary (For primary document see N86-14644 05-39)
Avail: Issuing Activity

Precision steel constructions are those in which the decisive importance is that of a limitation of deformation and reduction in the form (i.e., antennae). These have special requirements as far as the origin of limit states is concerned. It is considered a failure, therefore, when a structure is below the accepted level of its load capacity while experiencing an increase in angular oscillation. Precision constructions have then their own requirements as far as loading, materials, deformation, production, assembly, etc. are concerned. The problems of quasi-static and dynamic loading, elastic and elasto-plastic effect of construction, the influence of construction imperfections, effectiveness criteria, and the probability of raising the limit states are analyzed. Author

N86-14663# Technical Univ. of Brno (Czechoslovakia).
CONSIDERING THE PROBABILITY FEATURE OF ELASTIC CHARACTERISTICS OF BUILDING STEELS IN DESIGN PRECISE METALLIC CONSTRUCTIONS ACCORDING TO LIMIT STATES
Kh. M. Khanukhov *In its* Design Limit States of Steel Structures: 1st International Correspondence Conference 1983/84, Vol. 1 1983 p 202-217 refs In RUSSIAN; ENGLISH summary (For primary document see N86-14644 05-39)
Avail: Issuing Activity

The limit state of precision construction depends on the variation of physical-mechanical properties of the material. Because limited elastic deformation is the decisive factor in this case, the limit of elasticity BETA sub t substitutes for the yield point BETA sub t used in the calculation of common constructions. The results of the investigation of the static and dynamic modulus of elasticity and the yield points depending on the type of steel, type of product, temperature and the level of strain are given. The yield point is determined for three conventional values of residual relative deformations (0.001; 0.01 and 0.05). The results obtained may be used for designing precision constructions according to limit states. Main principles and particular instructions are discussed. Author

N86-14664# Technical Univ. of Brno (Czechoslovakia).
SPECIALITIES OF DESIGN ACCORDING TO THE SECOND LIMIT STATE IN CONSTRUCTIONS WITH A TOLERANCE IN SHIFTING JOINTS
A. S. Gvamichava *In its* Design Limit States of Steel Structures: 1st International Correspondence Conference 1983/84, Vol. 1 1983 p 218-229 In RUSSIAN; ENGLISH summary (For primary document see N86-14644 05-39)
Avail: Issuing Activity

From the point of view of the second group of limit states (serviceability), it is necessary to the case of some constructions —especially rod structures—to pay attention to the influence of tolerances in joints on deformation. Various characteristics of tolerances in nodes of plane and spatial rod systems, the procedure for computation of resulting forces, moments and deformations are given, and the acquired information is demonstrated by means of two examples. The given computational deformation procedure finds application, i.e., in assemblies and in rod constructions connected by screws, pins, etc. such as radiotelescopes, various towers and antenna systems, where from the point of view of applicability it is necessary to institute frequently rather strict criteria. Author

N86-14665# Technical Univ. of Brno (Czechoslovakia).
LIMIT STATES OF A CABLE STRUCTURAL ELEMENT
B. Rosenkranz *In its* Design Limit States of Steel Structures: 1st International Correspondence Conference 1983/84, Vol. 1 1983 p 272-281 refs In RUSSIAN; ENGLISH summary (For primary document see N86-14644 05-39)
Avail: Issuing Activity

A comparison of various methods of evaluation of a cable structure element strained with tension using estimation methodology according to limit states valid today is given. From the analyses it results that, anchor cables, for example, were earlier exploited only to about 33% of their nominal bearing capacity, are now exploited up to 69%. However, a higher level of the state of stress of the cable element results in a far higher probability of occurrence of defects during the service life of the cable element. Therefore, it is necessary to increase the attention towards the maintenance and control of cable elements to improve the service life of the cable element. Author

N86-14666# Technical Univ. of Brno (Czechoslovakia).
DESIGN LIMIT STATES OF STEEL STRUCTURES: 1ST INTERNATIONAL CORRESPONDENCE CONFERENCE 1983/84, VOLUME 2
J. Melcher, ed. 1983 254 p refs In ENGLISH and RUSSIAN Conference held in Czechoslovakia, 1983 2 Vol.
Copyright. Avail: Issuing Activity

The Preliminary Report (Vol.11) of the conference Design Limit States of Steel Structures, which took place in Brno (Czechoslovakia) in 1983, reports on the design method according to limit states. In a number of countries this method already has been incorporated into standardized instructions for designing steel structures. In others, it has been proposed as an alternative to be used along with classical design procedures, i.e., the method of allowable stresses. For individual titles, see N86-14667 through N86-14681.

N86-14667# Ingenieurhochschule Cottbus (East Germany). Dept. of Structural Engineering.
IMPERFECTIONS OF BAR SYSTEMS IN THE GDR-SPECIFICATIONS
Karl Raboldt *In* Technical Univ. of Brno Design Limit States of Steel Structures: 1st International Correspondence Conference 1983/84, Vol. 2 1983 p 320-327 refs (For primary document see N86-14666 05-39)
Avail: Issuing Activity

The GDR (East Germany) expects to complete its shift from the classical design procedure (allowable stress method) for steel structures to the method of limit states by the late 1980's. The new standard is based on the elastic second-order concept, and includes column buckling, lateral buckling of beams, rod buckling, and local buckling. Throughout the system, initial geometric imperfections are also taken into account. Some of the latter are examined. F.M.R.

N86-14668# Technical Univ. of Brno (Czechoslovakia).
FINAL DEFLECTIONS AND THE DESIGN LIMIT STATE OF STEEL COMPRESSION MEMBER
Jindrich Melcher *In its* Design Limit States of Steel Structures: 1st International Correspondence Conference 1983/84, Vol. 2 1983 p 339-345 refs (For primary document see N86-14666 05-39)
Avail: Issuing Activity

An analysis of the compression member behavior from the point of view of the deformation criterion of the 1st group limit states is given. For the purpose of illustration of the so called Inversion method of designing some results of steel pipe compression tests are used. Real final lateral deflections of compression members (in addition to initial out-of-straightness) would be practically in the same range as that of the bent beam. It is proved that if small limit values of transverse deflections (for example under L/500) are demanded, the corresponding limit load carrying capacity of the compression member can be less than the specified buckling strength. Author

N86-14669# Ceskoslovenska Akademie Ved, Prague. Inst. of Theoretical and Applied Mechanics.
THE LIMIT STATE OF THE PLATE ELEMENTS OF STEEL STRUCTURES
Miroslav Skaloud *In* Technical Univ. of Brno Design Limit States of Steel Structures: 1st. International Correspondence Conference 1983/84, Vol. 2 1983 p 346-347 refs (For primary document see N86-14666 05-39)
Avail: Issuing Activity

The problem of the real effect of plate elements of steel construction is analyzed. The limit state of thin plate constructions must be defined with regard to the influence of initial imperfections and the effect of postcritical influence. The analysis of the limit state of ultimate capacity of plate elements, i.e., both for the construction of buildings and for steel bridges is discussed. There is also a discussion of the problem of the limit state of serviceability of thin plate elements and cases are cited when it is necessary to respect this limit state when designing the construction. Author

N86-14670# Technical Univ. of Prague (Czechoslovakia). Building Research Inst.
STABILITY PROBLEMS OF THIN WALL STRUCTURES AND THEIR LIMIT STATE
Irena Karnikova and Miroslav Skaloud (Ceskoslovenska Akademie Ved, Prague) *In* Technical Univ. of Brno Design Limit States of Steel Structures; 1st International Correspondence Conference 1983/84, Vol. 2 1983 p 358-376 (For primary document see N86-14666 05-39)
Avail: Issuing Activity

The results of experimental research of the limit state of longitudinally stiffened compression flanges are given. Twelve girders of large dimensions are tested together. The stress was measured by means of electric resistance strain gauges, utilizing a measuring center and a control computer (PDP 11-40). The area of buckling was followed stereophotogrammetrically. After the analysis of the results a definition of the limit state of longitudially stiffened flanges was obtained by reaching the membrane yield point. The compression flange meets the condition of adaptation and in this way there is a guarantee that there will be no breakdown due to low-cycle fatigue or buckling. The limit states of the first group for a stiffened compression flange must meet two conditions of reliability - that of reaching the membrane yield point and high cycle fatigue. Author

N86-14671# Tokyo Univ. (Japan).
STUDIES ON THE ULTIMATE STRENGTH OF PANELS SUBJECTED TO COMPRESSION
Yuzuru Fujita, Toshiharu Nomoto, and Osamu Niho (Mitsui Engineering and Shipbuilding Co., Ltd.) *In* Technical Univ. of Brno Design Limit States of Steel Structures: 1st International Correspondence Conference 1983/84, Vol. 2 1983 p 385-400 refs (For primary document see N86-14666 05-39)
Avail: Issuing Activity

A new analytical method of finding out the ultimate carrying capacity of stiffened plates is presented. The solution is based on a combination of results of elastic analysis (Rayleigh-Ritz or Galerkin method) and of plastic analysis issuing from the mechanism of failure. As a primary loading effect the axial pressure is considered; also discussed is the loading of panels by a shear or plate effect. The results of the method are compared with known solutions and experiments. Author

N86-14672# Technical Univ. of Prague (Czechoslovakia). Dept. of Civil Engineering.
LIMIT STATE OF BOX GIRDER COMPRESSION FLANGES WITH BOTH INITIAL GEOMETRICAL IMPERFECTION AND RESIDUAL STRESSES
Josef Machacek *In* Technical Univ. of Brno Design Limit States of Steel Structures: 1st International Correspondence Conference 1983/84, Vol. 2 1983 p 411-422 refs (For primary document see N86-14666 05-39)
Avail: Issuing Activity

Theoretical results of the solution of elasto-plastic buckling (stability) of unstiffened compression flanges with the influence of shear lag are presented. Equations are presented for a panel with a large degree of bending, and for the Ilyushin conditions of plane strains. The numerical solution is prepared with the application of the dynamic relaxation method. There are presented the following studies: the influence of the form of geometric imperfection, maxima of plastic deformations as a limitation for the design according to limit states, cyclic loading, the influence of internal stress, and the interaction between shear lag and buckling. Author

N86-14673# Slovak Academy of Sciences, Bratislava (Czechoslovakia). Inst. of Construction and Architecture.
LATERAL WEB DEFLECTIONS OF STEEL PLATE GIRDERS
Pavol Juhas *In* Technical Univ. of Brno Design Limit States of Steel Structures: 1st International Correspondence Conference 1983/84, Vol. 2 1983 p 423-436 refs (For primary document see N86-14666 05-39)
Avail: Issuing Activity

Thin webs of steel plate girders have certain initial lateral deformations that are random variables both from the point of view of size and their form. In the loading process thin webs laterally deform or they vibrate in the operational mode which develops at the beginning of the loading process either by gradual regrouping or by a sudden nonlinear buckling of the web. The operational form of lateral deformation of webs is decisive for the analysis of bearing power and total behavior of thin web steel plate girders. Transversal vibration of thin webs may cause the rise and gradual development of cracks in the sites of their welded joints with flangeplates and reinforcements. The ductility of the plate girder webs stressed by dynamic fatigue loading must, therefore, be limited. Author

N86-14674# Slovak Academy of Sciences, Bratislava (Czechoslovakia). Inst. of Building Construction and Architecture.
STEEL GIRDER WITH SLENDER WEB WITHOUT STIFFENERS
Jan Ravinger *In* Technical Univ. of Brno Design Limit States of Steel Structures: 1st International Correspondence Conference 1983/84, Vol. 2 1983 p 437-445 refs (For primary document see N86-14666 05-39)
Avail: Issuing Activity

In the case where the load influences the girder as a uniformly distributed force or as a system of densely distributed forces, it is possible and advantageous to use a girder with a slender web without stiffeners. Such a girder combines the weight advantage

of thin web construction with minimal production outlay. The results of the investigation of the bearing capacity of these types of girders are described. The theoretical treatment of critical loads and the analysis of the shapes of deformation of the slender web demonstrate the reason for the estimation procedure for the bearing capacity of the whole girder broken down to its components. The conclusion evaluates the limit state of the bearing capacity in accordance with Czechoslovak standards, and gives a comparison of theoretical results with experimental data. Author

N86-14675# Nagoya Univ. (Japan). Dept. of Civil Engineering.
USE OF THE NDSS DATA-BANK IN THE VALIDATION OF LIMIT STATES DESIGN PROCEDURES FOR STEEL STRUCTURES
Yuhshi Fukumoto and David A. Nethercot (Sheffield Univ.) *In* Technical Univ. of Brno Design Limit States of Steel Structures: 1st International Correspondence Conference 1983/84, Vol. 2 1983 p 446-457 refs (For primary document see N86-14666 05-39)
Avail: Issuing Activity

The history, the present situation, and the future application of National Data Bank for Steel Structures (NDSS) to the creation of standards for designing steel constructions are related. Attention is drawn especially to the collection of results of experimental research of compressed and bend members. The methodology of collecting data and their treatment is demonstrated. Author

N86-14676# Technical Univ. of Brno (Czechoslovakia).
THE LIMIT STATE OF STEEL CASTELLATED GIRDERS
V. V. Biryulev, V. M. Dobraczev, and V. G. Sebeshev *In its* Design Limit States of Steel Structures: 1st International Correspondence Conference 1983/84, Vol. 2 1983 p 458-469 refs In RUSSIAN; ENGLISH summary (For primary document see N86-14666 05-39)
Avail: Issuing Activity

Perforated girders always find application in designing economic steel constructions. The definition of the limit state of bearing capacity from the point of view of strength is usually based on a simplified computation model using just an elastic area of the beam behavior. The paper reminds us of some further more exact computation models; it draws the attention to the possibility of application of plastic reserves in monotonously increasing load and to the corresponding saving in steel. In a detailed way the procedure of the computation and design formulas for the evaluation of perforated girders in the elastic-plastic area are given; the harmony with the results of experiments is stressed. Author

N86-14677# Technical Univ. of Brno (Czechoslovakia).
LIMIT STATE IN THE AREA OF LOCAL LOADING WITH CONCENTRATED NORMAL AND SHEAR FORCES
P. Ferjencik and I. Balaz *In its* Design Limit States of Steel Structures: 1st International Correspondence Conference 1983/84, Vol. 2 1983 p 470-488 refs (For primary document see N86-14666 05-39)
Avail: Issuing Activity

The stresses in the anchoring region of the prestressed plate girder are studied. The results obtained and the method of analysis can be applied to other details of steel structures of analogous behavior. The scheme of the division of the anchoring region for the calculation of stresses according to the method of the finite elements (MFE) is shown. Numerical results according to the theory of local stresses and MFE are compared. The problem is also studied experimentally. The description of instruments and equipment, as well as the distribution of the strain-gauges are submitted. Theoretical results are compared with experimental values. Author

N86-14678# Technical Univ. of Prague (Czechoslovakia). Dept. of Steel Structures.
STEEL FRAMES, THEIR DESIGN MODELS AND DESIGN CRITERIA INCLUDING LARGE DEFLECTION AND PLASTICITY
Frantisek Wald *In* Technical Univ. of Brno Design Limit States of Steel Structures: 1st International Correspondence Conference 1983/84, Vol. 2 1983 p 503-508 refs (For primary document see N86-14666 05-39)
Avail: Issuing Activity

The investigation of steel frames exposed to monotonously increasing static loads is discussed. With the use of models and computer techniques the relation of the loading and transformation is shown in an example with the development of a definition of the ultimate design capacity based on permanent deformation. The rapid development of computer technology allows a broader application of models, especially in the investigation of frame and other metal structures. It is necessary to insure that the definition of the ultimate design capacity meets the condition that the structure must be able to absorb the least favorable defined effects of a load without losing its capability to continue fulfilling its function. Author

N86-14679# Kosice Technical Univ. (Czechoslovakia).
THE LIMIT STATE OF CARRYING CAPACITY: A DEMONSTRATION OF THE CONDITIONS OF RELIABILITY IN A SELECTED CONSTRUCTION DETAIL
Juraj Vircik, Pavel Marek, and Jan Hudak *In* Technical Univ. of Brno Design Limit States of Steel Structures: 1st International Correspondence Conference 1983/84, Vol. 2 1983 p 518-527 refs (For primary document see N86-14666 05-39)
Avail: Issuing Activity

The complexity of the problem of defining the bearing capacity in the sense of design according to limit states is emphasized. The welded connection of an I girder to an unstiffened plate of a column is analyzed. The problems of elastic and plastic bearing capacity shake-down, low-cycle fatigue, high-cycle fatigue, and fracture are discussed. For the verification of results an experimental program is designed including tests of 24 experimental formations. Author

N86-14680# Technical Univ. of Brno (Czechoslovakia).
ESTIMTAION OF LIMIT BEARING CAPACITY OF NODES OF TRUSS GIRDERS MADE OF RECTANGULAR TUBES
V. V. Biryulev and V. A. Galatenko *In its* Design Limit States of Steel Structures: 1st International Correspondence Conference 1983/84, Vol. 2 1983 p 528-534 refs In RUSSIAN; ENGLISH summary (For primary document see N86-14666 05-39)
Avail: Issuing Activity

The results of experimental and theoretical investigation of the bearing capacity of box girders with quadratic and rectangular cross sections, as well as of joints of these tubes with monotonously increasing loading effects are summarized. The principle of the method of limiting states and the possibility of defining strength by limiting plastic deformations are pointed out. Similarly the formulas proposed for design analysis and the extent of their validity are explained. The economy of box girders tubes is stressed. They bring from 18 to 20% savings of steel in comparison with more traditional girders. Author

N86-14681# Technical Univ. of Brno (Czechoslovakia).
DESIGN ESTIMATION OF LIMIT STATE OF ELEMENTS OF STEEL CONSTRUCTIONS WITH THE DEFECT OF QUASI-BRITTLE FRACTURE AT LOW TEMPERATURES
A. V. Silvestrov and S. D. Shafray *In its* Design Limit States of Steel Structures: 1st International Correspondence Conference 1983/84, Vol. 2 1983 p 535-544 refs In RUSSIAN; ENGLISH summary (For primary document see N86-14666 05-39)
Avail: Issuing Activity

Within the scope of the conditions of reliability in the group of limiting states of bearing capacity the defect by brittle fracture is of the greatest significance, especially in constructions exposed to low temperatures. The mechanism of the initiation and propagation of the fracture is discussed. The basic parameters influencing the risk of fracture are given, and the methodology of estimation of selected construction details at low temperatures is described. The procedures of calculation and estimation are demonstrated by two examples. The reliability from the point of view of a quasi-brittle fracture is formally expressed by a decrease of fracture strength by the coefficient beta, which takes into account the temperature of the environment, the type of steel, and the geometry and thickness of the material. Author

N86-14682 Harvard Univ., Cambridge, Mass.
THERMOELASTIC ATTENUATION IN COMPOSITES, POLYCRYSTALS, AND CRACKED SOLIDS Ph.D. Thesis
Eric Eden Sumner, Jr. 1985 121 p
Avail: Univ. Microfilms Order No. DA8510225

Self-consistent estimates are made for the thermoelastic bulk and shear attenuation in three types of heterogeneous solids: multi-phase composites of isotropic constituents, polycrystals composed of anisotropic grains, and homogeneous solids containing fluid saturated cracks. These estimates may provide insight into the composition of the earth's interior since studies of the earth's radial modes of free oscillation have shown that bulk attenuation occurs therein. Two methods for the analysis of thermoelastic attenuation in heterogeneous materials are discussed. Derivation of complex, frequency-dependent, adiabatic moduli K (omega) and G (omega) yields Q sub k (omega) and Q sub G (omega) through the definitions Q sub k = Re[K]/Im[K] and Q sub g = Re[G]/Im[G]. Alternatively, relaxation strengths delta K and delta G can provide integral constraints upon Q sub k and Q sub g through the Kramers-Kronig relations. Although delta K and delta G provide less information about the relaxation spectra than do K (omega) and G (omega), their calculation requires only a method for the determination of the effective isothermal moduli K sup T and G sub T and the effective thermal coefficients beta and C sub NU. Author

N86-14683 Virginia Polytechnic Inst. and State Univ., Blacksburg.
THE RESIDUAL STRENGTH DETERMINATION DUE TO FATIGUE LOADING BY FRACTURE MECHANICS IN NOTCHED COMPOSITE MATERIALS Ph.D. Thesis
Ming-Hwa Robert Jen 1985 165 p
Avail: Univ. Microfilms Order No. DA8511968

The objective was to predict the residual strength of notched composite laminates with various layups, subjected to low frequency fatigue loading with constant amplitude at room temperature, by using a material modeling approach, fracture and fatigue mechanics and the finite element method (FEM). The effect of geometry change during fatigue on residual strength was attributed to the elliptical hole, longitudinal splitting, matrix cracking (reduction moduli of plies), crack propagation and local delamination. Reduction of stress concentration is a reason for the increase of the residual strength of the notched laminate. The stress concentration factor decreases while the elliptic hole becomes more slender. The residual strength and stiffness were determined by the material modeling with moduli reaction and damaged zone, and the numerical result was obtained by FEM. Laminate theory, point stress criterion, polynomial failure criterion, ply discount method, and fatigue and fracture mechanics (Paris' Power Law) were also included in this research. Dissert. Abstr.

N86-14684 Stanford Univ., Calif.
ON THE STOCHASTIC MODELING OF FATIGUE CRACK GROWTH Ph.D. Thesis
Keith Ortiz 1985 120 p
Avail: Univ. Microfilms Order No. DA8511341

The variance of the probability distribution of crack propagation fatigue life is often underpredicted by probabilistic models, especially when the crack growth increment is short. Consequently, the probability of fatigue failure may be underestimated. A stochastic model in the linear elastic fracture mechanics format which may be used to make better predictions of this distribution is developed. The variations of the material's resistance to fatigue crack growth along the path of the crack are modeled by a random process. These variations are statistically characterized by the probability distribution of the fatigue crack growth law coefficients and a spatial stochastic process representing the deviations of the true logarithmic growth rate from the growth law. The stochastic process is assumed to be stationary, Gaussian, and independent of the crack tip stress intensity factor. The stochastic modeling is divided into three problems. The first problem is the statistical analysis of fatigue crack growth rate data. The second problem is the predictive modeling of the growth observed in the tests. The third problem is the theoretical extension of the model to include the case of random amplitude stress range tests. Author

N86-14685# Sydney Univ. (Australia). School of Civil and Mining Engineering.
INELASTIC LATERAL BUCKLING OF BEAM-COLUMNS
M. A. Bradford, P. E. Cuk, M. A. Gizejowski, and N. S. Trahair Jun. 1984 48 p refs
(R-474) Avail: NTIS HC A03/MF A01

An accurate line model based on the finite element method was developed to analyze the inelastic lateral buckling of I-section beams and beam columns. The prebuckling in-plane bending is analyzed by a geometrically nonlinear inelastic finite element method which accounts for the effects of prebuckling displacements and residual stresses on yielding. The results of the prebuckling analysis allow the distributions of yielding and strain hardening throughout the beam to be determined. The out-of-plane flexural-torsional buckling of the inelastic element is analyzed by adapting an elastic tapered monosymmetric finite element. For this element, the deflections and twists are referred to an arbitrary straight line axis along the midheight of the web, instead of the shear center of centroidal axes. The elastic element is adapted for inelastic buckling by using reduced out-of-plane stiffnesses which allow for yielding and strain-hardening. E.A.K.

N86-14686# Queensland Univ., St. Lucia (Australia). Dept. of Civil Engineering.
LARGE DEFLECTION AND POST-BUCKLING ANALYSIS OF TWO AND THREE DIMENSIONAL ELASTIC SPATIAL FRAMES
J. L. Meek and H. S. Tan Dec. 1983 70 p refs
(RR-CE-49) Avail: NTIS HC A04/MF A01

The safe and economical design of curved spatial frames which necessitates a geometrical nonlinear analysis of the structure is discussed. The nonlinear equations governing such structural behavior are derived. Solution strategies which are capable of analyzing the post-buckling behavior of structures are reviewed. An extrapolation stiffness method that lends itself to a more effecient solution of the nonlinear equations than conventional Newton-Raphson methods is presented. The postbuckling responses of various spatial frames are analyzed. E.A.K.

N86-14687*# Old Dominion Univ., Norfolk, Va. Dept. of Mechanical Engineering and Mechanics.
THREE-DIMENSIONAL ELASTIC-PLASTIC FINITE-ELEMENT ANALYSIS OF FATIGUE CRACK PROPAGATION Final Report, 1 Jun. - 1 Nov. 1985
G. L. Goglia and R. G. Chermahini Nov. 1985 60 p refs
(Grant NAG1-529)
(NASA-CR-176415; NAS 1.26:176415) Avail: NTIS HC A04/MF A01 CSCL 20K

Fatigue cracks are a major problem in designing structures subjected to cyclic loading. Cracks frequently occur in structures such as aircraft and spacecraft. The inspection intervals of many aircraft structures are based on crack-propagation lives. Therefore, improved prediction of propagation lives under flight-load conditions (variable-amplitude loading) are needed to provide more realistic design criteria for these structures. The main thrust was to develop a three-dimensional, nonlinear, elastic-plastic, finite element program capable of extending a crack and changing boundary conditions for the model under consideration. The finite-element model is composed of 8-noded (linear-strain) isoparametric elements. In the analysis, the material is assumed to be elastic-perfectly plastic. The cycle stress-strain curve for the material is shown Zienkiewicz's initial-stress method, von Mises's yield criterion, and Drucker's normality condition under small-strain assumptions are used to account for plasticity. The three-dimensional analysis is capable of extending the crack and changing boundary conditions under cyclic loading. Author

N86-14688*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SCARE: A POST-PROCESSOR PROGRAM TO MSC/NASTRAN FOR THE RELIABILITY ANALYSIS OF STRUCTURAL CERAMIC

COMPONENTS
John P. Gyekenyesi [1985] 24 p refs To be presented at the 31st International Gas Turbine Conference and Exhibit, Dusseldorf, West Germany, 8-12 June 1986; sponsored by the American Society of Mechanical Engineers
(NASA-TM-87188; E-2654; NAS 1.15:87188) Avail: NTIS HC A02/MF A01 CSCL 20K

A computer program was developed for calculating the statistical fast fracture reliability and failure probability of ceramic components. The program includes the two-parameter Weibull material fracture strength distribution model, using the principle of independent action for polyaxial stress states and Batdorf's shear-sensitive as well as shear-insensitive crack theories, all for volume distributed flaws in macroscopically isotropic solids. Both penny-shaped cracks and Griffith cracks are included in the Batdorf shear-sensitive crack response calculations, using Griffith's maximum tensile stress or critical coplanar strain energy release rate criteria to predict mixed mode fracture. Weibull material parameters can also be calculated from modulus of rupture bar tests, using the least squares method with known specimen geometry and fracture data. The reliability prediction analysis uses MSC/NASTRAN stress, temperature and volume output, obtained from the use of three-dimensional, quadratic, isoparametric, or axisymmetric finite elements. The statistical fast fracture theories employed, along with selected input and output formats and options, are summarized. An example problem to demonstrate various features of the program is included. Author

N86-14689*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SPARTAN SERVICE MODULE FINITE ELEMENT MODELING TECHNIQUE AND ANALYSIS
Alan J. Lindenmoyer Oct. 1985 25 p refs
(NASA-TM-86228; Rept-85B0512; NAS 1.15:86228) Avail: NTIS HC A02/MF A01 CSCL 20K

Sounding rockets have served as a relatively inexpensive and easy method of carrying experiments into the upper atmosphere. Limited observation time and pointing capabilities suggested the development of a new sounding rocket type carrier compatible with NASA's Space Transportation System. This concept evolved into the Spartan program, now credited with a successful Spartan 101 mission launched in June 1985. The next series of Spartans will use a service module primary structure. This newly designed reusable and universal component in the Spartan carrier system required thorough analysis and evaluation for flight certification. Using advanced finite element modeling techniques, the structure was analyzed and determined acceptable by meeting strict design goals and will be tested for verification of the analytical results. Author

N86-14690# Wisconsin Univ., Milwaukee.
STRESS ANALYSIS COMBINING SPECKLE METROLOGY WITH FINITE ELEMENT MODELING
D. R. Matthys, T. D. Dudderar, J. A. Gilbert, M. A. Taher, and H. S. Johnson 1985 9 p
(Contract DAAG29-84-K-0183; Grant DAAG29-84-G-0045)
(AD-A158349; ARO-21671.1-EG; ARO-22148.1-EG-RI) Avail: NTIS HC A02/MF A01 CSCL 14/2

Work was conducted to demonstrate the validity of the hybrid approach to the analysis of structural deformation. Mathematical modelling was incorporated into the process of reducing data from a digital correlation analysis of a speckled surface. The experimental data was collected both by directly imaging the surface onto a digitizing vidicon system and by transmitting the image through a coherent optical fiber bundle. Considerable savings of time and resources can be realized through the hybrid approach and the strengths of the theoretical and experimental procedures complement each other beautifully. The final results agreed within a few percent of each other and with values obtained by another independent method (high frequency moire), demonstrating the accuracy of the procedure. GRA

N86-14691# Washington Univ., Seattle. Dept. of Mechanical Engineering.
ANALYSIS OF TRANSIENT STRAINS SURROUNDING RUNNING CRACKS IN METAL AND PLASTIC PLATES Final Report
A. S. Kobayashi Aug. 1985 11 p
(Contract N00014-76-C-0060)
(AD-A158659; UWA/DME/TR-85/52) Avail: NTIS HC A02/MF A01 CSCL 20/11

The objective of this research program is to investigate experimentally the transient strain and stress distribution in the vicinity of a running crack in engineering materials. The elasto-dynamic state of stresses in the neighborhood of a rapidly running crack tip was determined experimentally for developing relations between the dynamic stress intensity factors under opening mode and mixed-mode loadings. GRA

N86-14692# Materials Research Labs., Ascot Vale (Australia).
EXPLOSION BULGE TESTING OF AUSTRALIAN HY-80 STEEL PLATE
J. C. Ritter and B. F. Dixon Mar. 1985 50 p
(AD-A158896; MRL-R-958) Avail: NTIS HC A03/MF A01 CSCL 11/6

This report describes the program of explosion bulge testing of 50 mm thick Australian sourced HY-80 steel plate, supplied by Bunge Industrial Steels P/L to Industry Development Branch (NSW Region) to specification MIL-S-16216H (SHIPS). The testing was undertaken as part of the qualification of this steel in compliance with U.S. NAVSEA requirements. The report deals with the first series of tests which were unsuccessful, the testing of unwelded plate, the development of manual metal arc welding procedures and the investigation of candidate welding consumables which ultimately led to a successful test series. The successful welds used low hydrogen electrodes of the AWS 10018 M type supplied by Philips (UK). The procedure followed a stringer-bead technique with strict limits on heat input, and a weld design incorporating a novel top-hat profile aimed at locating the weld toes (potential crack initiation sites, well away from the remaining weld fusion boundary (potential path for through-thickness crack propagation). Author (GRA)

N86-14693# Massachusetts Inst. of Tech., Cambridge.
THE ATTENUATION OF FLEXURAL WAVES IN MASS LOADED BEAMS M.S. Thesis
T. L. Smith May 1985 186 p
(Contract N66314-70-A-0073)
(AD-A159039) Avail: NTIS HC A09/MF A01 CSCL 20/11

This thesis experimentally tests the effects of resiliently mounted, independent masses on the propagation of flexural waves in a rectangular beam. The flexural waves are attenuated over a wide frequency band, and the magnitude and band of the attenuation is determined by the attached mass per unit length and the spring constant and resistance per unit length of the mounting material. The experimental results are compared with analytical predictions for the flexural wave attenuation. The results confirm the analytical model used and that the attached mass system acts as a dynamic absorber. GRA

N86-14694# Massachusetts Inst. of Tech., Cambridge.
TORSIONAL BUCKLING OF I BEAM AND FLAT BAR STIFFENERS UNDER COMBINED LATERAL AND AXIAL LOADING M.S. Thesis
G. E. Klein, Jr. Jun. 1985 72 p
(Contract N66314-70-A-0073)
(AD-A159041) Avail: NTIS HC A04/MF A01 CSCL 20/11

The prediction of torsional buckling of stiffeners is a necessary design skill in the planning of any framed structure or vehicle. The likelihood of torsional failure is increased when the stiffener is simultaneously loaded from perpendicular directions, a common loading condition for the frames of a ship at sea. This thesis examines first the case of a single lateral load on I beam and flat bar stiffeners and then the instance of combined lateral and axial loadings. An energy method is used and formulated are expressions for the critical buckling load for a single laterally applied force

and a formula relating lateral and axial loads and giving an indication of the relative weakening of a stiffener caused by simultaneous application of both forces. GRA

N86-14695# National Bureau of Standards, Gaithersburg, Md. Inorganic Materials Div.
STRUCTURAL RELIABILITY OF BRITTLE MATERIALS AT HIGH TEMPERATURES Annual Report, 1 Oct. 1983 - 30 Sep. 1984
S. M. Wiederhorn, N. J. Tighe, T. J. Chuang, K. A. Hardman-Rhyne, and B. J. Hockey 31 Dec. 1984 199 p
(Grant AF-AFOSR-ISSA-84-00013)
(AD-A159202; AFOSR-85-0686TR) Avail: NTIS HC A09/MF A01 CSCL 15/7

Work during the past year was conducted on yttria-doped hot-pressed silicon nitride, alpha-silicon carbide, and a glass-bonded aluminum oxide. The first two materials were selected for study because of their potential for high temperature structural application, whereas the latter material was selected as a model material to investigate the creep-rupture behavior of two phase ceramics. During the past year our work emphasized the microstructural analysis of these materials and the effect of microstructure on component lifetime. A study has also been started on the effect of microstructure on component lifetime. A study has also been started on the effect of temperature on the strength of a commercial grade of partially stabilized zirconium oxide. The brief summary presented below gives our major findings on each of these materials. Full papers for each study are included in this report. Author (GRA)

N86-14696# California Inst. of Tech., Pasadena. Graduate Aeronautical Labs.
DYNAMIC FRACTURE IN VISCOELASTIC SOLIDS Final Report
W. G. Knauss 30 Jun. 1985 58 p
(Contract N00014-78-C-0634)
(AD-A159498; GALCIT-SM-85-14) Avail: NTIS HC A04/MF A01 CSCL 20/11

Three areas of dynamic viscoelastic crack propagation are considered experimentally. To the extent that the gross mechanical properties of a material are viscoelastic, its fracture behavior should be influenced by rate effects (loading rates, crack speeds, etc.) and by temperature through the time-temperature relation. Homalite 100 and a polyurethane, Solithane 113, chosen as model materials, are studied using the method of caustics and high speed photography. The variation of the stress intensity factor and the velocity of a running crack are determined when initiated and driven by dynamic step loading on the faces of an initial semi-infinite crack in an infinite medium. Post-mortem analysis of the fracture surfaces and manipulation of parameters in the materials manufacturing process are utilized to illuminate the micromechanics of the fracture behavior, in particular as it relates to crack branching.
Author (GRA)

N86-14697# Ballistic Research Labs., Aberdeen Proving Ground, Md.
A COMPUTATIONAL INVESTIGATION OF THE EFFECT OF SHIELDING IN MITIGATING SHOCK INITIATION STIMULI PRODUCED BY IMPACT Final Technical Report
J. Starkenberg, T. M. Dorsey, and K. J. McGlothlin Sep. 1985 63 p
(AD-A159506; BRL-TR-2672) Avail: NTIS HC A04/MF A01 CSCL 19/4

We have conducted a study of the role of shielding in reducing the shock initiation stimulus for a simple one-dimensional representation of the problem of sympathetic detonation of munitions. We found that single layered shields made of materials with low acoustic impedance generally produce a complex shock wave structure in the acceptor. This complex structure is associated with a low level of initiation stimulus because of the breakup into several weaker shocks and the reduction of the integral of p squared with respect to t. High impedance shield materials also substantially reduce the initiation stimulus, but without the accompanying shock breakup effect. Increasing shielding thickness improves performance and can change the order of effectiveness of shield materials. With multi-layered shields composed of a high-impedance and a low-impedance material we observed shock structures depending strongly on the ordering of the materials in the shield. Multiple shock structure usually observed when the high-impedance material was the outer component of the shield and sufficient low-impedance material was present. Single compression waves with variable peak pressures and rise times were usually observed when the low-impedance material was the outer component of the shield. Substantial benefits in terms of shock breakup and the integral of p squared with respect to t reduction can be obtained by increasing the thickness of three-layered shields, which were found to perform better than five-layered shields. GRA

N86-14698# Lawrence Livermore National Lab., Calif.
COMPUTER SIMULATION AND ANALYSIS OF THE EXPANDING RING TEST
J. E. Reaugh Jun. 1985 12 p refs Presented at the American Physical Society Topical Conference on Shock Waves in Condensed Matter, Spokane, Washington, 22 Jul. 1985
(Contract W-7405-eng-48)
(DE85-016943; UCRL-92776; CONF-850736-58) Avail: NTIS HC A02/MF A01

Explosive launched expanding ring tests have been used to extract material flow stress at strain-rates from 1000 to 3 x 10,000 sec-1. Computer simulations of such tests using a strain-rate independent, but work hardening constitutive model were analyzed by the same methods used experimentally. Results of this analysis also showed an apparent strain-rate effect. Further examination of the computer simulations has shown that much, if not all, of the measured strain-rate effect is an increased flow stress due to a plastic strain, epsilon sub L, that is locked in during the initial stages of launch. At a larger launch velocity, hence a larger strain-rate, epsilon sub L, is also larger. The value of epsilon sub L is sensitive to details of the launch dynamics.
DOE

N86-14699# Oak Ridge National Lab., Tenn. Solid State Div.
TEM STUDIES OF CRACK TIP DEFORMATION IN BCC MOLYBDENUM AT LOW TEMPERATURES
C. G. Park and S. M. Ohr 1984 15 p Presented at the International Symposium on High Temperature Corrosion in Energy Systems, Detroit, Michigan, 17 Sep. 1984
(Contract DE-AC05-84OR-21400)
(DE85-017087; CONF-840978-5) Avail: NTIS HC A02/MF A01

Electron microscope studies have been made of the slip systems that are activated at the crack tip in bcc molybdenum during in situ tensile deformation at various temperatures (100 approx. 300 K). At ambient temperature, all three modes of crack tip deformation have been observed under an applied stress. Dislocations are emitted from the tips of propagating cracks, pass rapidly through a dislocation-free zone (DFZ) and pile up in a plastic zone. The observed crack tip slip systems were analyzed in terms of the crack tip Schmid factor obtained from the resolved shear stress modified by the presence of a crack. Results show that crack tip deformation occurs by the emission of dislocations from the crack tip, and that the shear crack of mode III is most prevalent mode. Therefore, the choice of slip system is primarily dictated by the crack tip Schmid factor, along with the critical stress intensity factor for dislocation emission from the crack tip. The temperature dependence of crack tip deformation and its relationship to the ductile-brittle transition have also been examined. The slip systems possessing the maximum crack tip Schmid factors are usually activated from the crack tip at temperatures above 150 K. At temperatures below 140 K, a brittle crack (cleavage) is preceded by mixed mode crack tip deformation, although the extent of the deformation is markedly reduced. The ductile-brittle transition of the fracture mode observed in the electron microscope agreed well with the mechanical behavior of the metal observed from bulk tensile tests performed at low temperatures. DOE

N86-14700# Sandia National Labs., Albuquerque, N. Mex.
GROWTH OF INHOMOGENEOUS THERMOPLASTIC SHEAR
D. E. Grady and M. E. Kipp 1985 9 p Presented at the International Conference on Mechanics and Physical Behavior of Materials under Dynamics Loading, Paris, France, 2 Sep. 1985
(Contract DE-AC04-76DP-00789)
(DE85-008220; SAND-84-1107C; CONF-850946-1) Avail: NTIS HC A02/MF A01

The catastrophic growth of unstable thermoplastic shear following the transition from homogeneous deformation to heterogeneous localized deformation through distributed shear banding is studied through approximate analytic and computational methods. The calculations provide expressions for shear-bandwidths, spacing, catastrophic growth times and the rate of stress communication between shear bands. The calculations are applied to heterogeneous shear localization observed in the steady-wave shock compression of aluminum. DOE

N86-14701# Lawrence Livermore National Lab., Calif.
SIMPLE RIGID BODY ALGORITHM FOR STRUCTURAL DYNAMICS PROGRAMS, PART 1
D. J. Benson and J. O. Hallquist Sep. 1984 15 p Presented at the International Conference on Advances in Numerical Methods in Engineering: Theory and Applications, Swansea, England, 7 Jan. 1985
(Contract W-7405-eng-48)
(DE85-001565; UCRL-90580-1-Pt-1; CONF-850116-2-Pt-1) Avail: NTIS HC A02/MF A01

The analysis of low velocity impacts is necessary for designing everything from safe automobiles to safe shipping casks for nuclear material. Although great strides have been made in reducing the cost of impact analysis, the cost must be reduced even more before impact analysis becomes a routine design tool. One approach replaces the mesh outside of the impact zone with a rigid body. DOE

N86-14702# Centre Technique des Industries Mecaniques, Senlis (France).
THREE-DIMENSIONAL PHOTOELASTOMETRIC STUDY OF BODIES OR PIPES UNDER A FLUID PRESSURE Final Report [ETUDE PAR PHOTOELASTICIMETRIE TRIDIMENSIONNELLE D'ENCEINTES OU DE TUBES SOUMIS A UNE PRESSION DE FLUIDE]
A. LHermite May 1984 33 p refs In FRENCH
(CETIM-15-G-191) Avail: NTIS HC A03/MF A01

Experimental parameters were obtained in order to allow the realization of appropriate simulations of high fluid pressure loads. By choosing a low modulus and high birefringence model, such as an epoxy resin model of a metallic body, the equivalent loads are divided by a factor of 2300. Different systems to apply the load to the model are discussed. The measurement of strain and birefringence give information relevant to practical applications, including nonlinear optical behavior of epoxy resins. Author (ESA)

N86-14703# Centre Technique des Industries Mecaniques, Senlis (France).
SIMULATION AND ESTIMATION OF FATIGUE LIFE Final Report [SIMULATION ET PREVISION DE DUREE DE VIE EN FATIGUE]
R. Gregoire Mar. 1985 277 p refs In FRENCH
(CETIM-100-610) Avail: NTIS HC A13/MF A01

The experimental results obtained using notched specimens in real loading are studied and compared with simulated random or block loading. The simplification methods in real loading are correlated with cumulative damage computations (Miner and Chaboche criteria). The proposed method can deal with nonGaussian and asymmetric loads. It is shown that the life estimation obtained is both reproducible and reliable for a given load sequence. Author (ESA)

N86-14704# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
PROGRESS IN COLLAPSE ANALYSIS
E. Riks 20 Feb. 1984 21 p refs Presented at 1984 ASME Pressure Vessel and Piping Conference, San Antonio, Texas, Jun. 1984
(NLR-MP-84031-U; B8566806) Avail: NTIS HC A02/MF A01

Finite element computation of collapse states of structures prone to unstable behavior is discussed. The cause of the so-called limit point obstacle is simple: inappropriate parametrization of the governing equations in the neighborhood of the limit point. Remedies to overcome the problem are reviewed, including the principle of adaptive parametrization which is the basis of a procedure for collapse analysis in the finite element code STAGS. The treatment of simple bifurcation points is included, since unstable bifurcation can be considered a special form of collapse. It is concluded that collapse problems do not present difficulties that exceed those normally encountered during the solution of nonlinear deformation paths. Author (ESA)

N86-14705# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
PHOTONICS FOR DEFORMATIONS
Pieter J. Sevenhuijsen 29 Mar. 1984 12 p refs Presented at 5th International Congression on Experimental Mechanics, Montreal, Canada, 10-15 Jun. 1984
(NLR-MP-84038-U; B8566808) Avail: NTIS HC A02/MF A01

Photonic systems for measuring structural deformation are described. A laser grating method and an elementary grid method for measuring in-plane deformations of opaque surfaces, and a lens-grid method for measuring out-of-plane deformations are presented. Author (ESA)

N86-14415# Osaka Univ. (Japan). Dept. of Architectural Engineering.
NUMERICAL ANALYSIS OF STEEL FRAME STRUCTURES SUBJECTED TO THERMAL GRADIENTS
Sadayoshi Igarashi and Kosal Cheat Eng (Shimizu Construction Co. Ltd.) *In its* Technology Reports of the Osaka University, Vol. 35, Nos. 1800-1818 Oct. 1985 p 269-278 refs (For primary document see N86-14405 05-31)
Avail: NTIS HC A09/MF A01

N86-14421# Yamaguchi Univ., Ube (Japan).
ELASTO-PLASTIC STRESS ANALYSIS BY BOUNDARY ELEMENT METHOD
Ken Kaminishi, Shun-ichi Kawano, and Shigetoshi Shimizu *In its* Memoirs of the Faculty of Engineering, Yamaguchi University, Vol. 36, No. 1 Oct. 1985 p 17-24 refs In JAPANESE; ENGLISH summary (For primary document see N86-14418 05-31)
Avail: NTIS HC A09/MF A01

N86-14428# Yamaguchi Univ., Ube (Japan).
RUPTURE PROPAGATION ANALYSES BY THE THREE DIMENSIONAL FINITE ELEMENT METHOD WITH JOINT ELEMENT
Fusanori Miura, Yoshihiro Okashige, and Hiroshi Okinaka *In its* Memoirs of the Faculty of Engineering, Yamaguchi University, Vol. 36, No. 1 Oct. 1985 p 81-87 refs In JAPANESE; ENGLISH summary (For primary document see N86-14418 05-31)
Avail: NTIS HC A09/MF A01

N86-14905# Army Materials and Mechanics Research Center, Watertown, Mass.
BUCKLED ELASTICA IN CONTACT: FINITE ELEMENT SOLUTIONS
A. R. Johnson and C. J. Quigley *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 37-47 (For primary document see N86-14902 05-59)
(AD-P004904) Avail: NTIS HC A99/MF E03 CSCL 12/1

N86-14910# Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Civil Engineering.
DYNAMIC INSTABILITY OF THE FLEXIBLE COUPLER OF A FOUR-BAR MECHANISM
I. G. Radjbakhsh *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 105-116

(For primary document see N86-14902 05-59)
(AD-P004909) Avail: NTIS HC A99/MF E03 CSCL 12/1

N86-14912# Wayne State Univ., Detroit, Mich. Dept. of Mathematics.
OPTIMAL CORRECTIONS OF A DAMPED LINEAR OSCILLATOR UNDER RANDOM PERTURBATIONS
P. L. Chow and J. L. Menaldi *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 149-158 (For primary document see N86-14902 05-59)
(Contract DAAG29-83-K-0014)
(AD-P004911) Avail: NTIS HC A99/MF E03 CSCL 12/1

N86-14924# Sandia National Labs., Albuquerque, N. Mex.
CONSTITUTIVE FEATURES OF SOLIDS AT SHOCK-WAVE LOADING RATES
D. E. Grady *In* ARO Transations of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 303-311 Previously announced as N85-12325 (For primary document see N86-14902 05-59)
(Contract DE-AC04-76DP-00789)
(AD-P004923) Avail: NTIS HC A99/MF A01 CSCL 20/14

N86-14926# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.
A MORE ACCURATE SOLUTION TO THE ELASTIC-PLASTIC PROBLEM OF PRESSURIZED THICK-WALLED CYLINDERS
P. C. T. Chen *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 319-329 (For primary document see N86-14902 05-59)
(AD-P004925) Avail: NTIS HC A99/MF E03 CSCL 20/11

N86-14927# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
A REFINED SHEAR DEFORMATION THEORY FOR LAMINATED ANISOTROPIC PLATES
J. N. Reddy *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 331-342 (For primary document see N86-14902 05-59)
(AD-P004926) Avail: NTIS HC A99/MF E03 CSCL 12/1

N86-14929# Army Materials and Mechanics Research Center, Watertown, Mass.
IMPORTANCE OF CRACK TIP SHAPE IN ELASTIC-PLASTIC FRACTURE ANALYSIS
In ARO Transations of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 359-371 (For primary document see N86-14902 05-59)
(AD-P004928) Avail: NTIS HC A99/MF E03 CSCL 20/11

N86-14930# Army Materials and Mechanics Research Center, Watertown, Mass.
KINEMATIC HARDENING APPLIED TO NON-PROPORTIONAL LOADING
C. S. White *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 373-387 (For primary document see N86-14902 05-59)
(AD-P004929) Avail: NTIS HC A99/MF E03 CSCL 20/11

N86-14939# Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Civil Engineering.
POST-BUCKLING ANALYSIS OF AN ELASTIC WITH ONE AND MANY CRITICAL LOADS
I. G. Tadjbakhsh *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 597-610 (For primary document see N86-14902 05-59)
(AD-P004939) Avail: NTIS HC A99/MF E03 CSCL 12/1

N86-14951# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.
DYNAMIC RESPONSE IN AN ELASTIC-PLASTIC PROJECTILE DUE TO NORMAL IMPACT
P. C. T. Chen, J. E. Flaherty, and J. D. Vasilakis *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 839-858 (For primary document see N86-14902 05-59)
(AD-P004952) Avail: NTIS HC A99/MF E03 CSCL 12/1

N86-14952# Wisconsin Univ., Madison. Mathematics Research Center.
ON THE ASYMPTOTIC ANALYSIS OF TRAVELLING SHOCKS AND PHASE BOUNDARIES IN ELASTIC BARS
T. J. Pence *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 859-874 (For primary document see N86-14902 05-59)
(Contract DAAG39-80-C-0041; Grant NSF MCS-82-10950)
(AD-P004953) Avail: NTIS HC A99/MF E03 CSCL 20/11

N86-14953# Illinois Univ., Chicago. Dept. of Civil Engineering Mechanics and Metallurgy.
EIGENFUNCTIONS AT A SINGULAR POINT IN TRANSVERSELY ISOTROPIC MATERIALS UNDER AXISYMMETRIC DEFORMATIONS
T. C. T. Ting, Y. Jin, and S. C. Chou *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 875-882 (For primary document see N86-14902 05-59)
(AD-P004954) Avail: NTIS HC A99/MF E03 CSCL 12/1

42 GEOSCIENCES (GENERAL)

N86-14706*# Soils International, San Gabriel, Calif.
INVESTIGATION OF SEISMICITY AND RELATED EFFECTS AT NASA AMES-DRYDEN FLIGHT RESEARCH FACILITY, COMPUTER CENTER, EDWARDS, CALIFORNIA Final Report
Robert D. Cousineau, Richard Crook, Jr., and David J. Leeds Nov. 1985 126 p refs
(Contract NCA2-OR283-304)
(NASA-CR-170415; NAS 1.26:170415; L-1615-F) Avail: NTIS HC A07/MF A01 CSCL 08G

This report discusses a geological and seismological investigation of the NASA Ames-Dryden Flight Research Facility site at Edwards, California. Results are presented as seismic design criteria, with design values of the pertinent ground motion parameters, probability of recurrence, and recommended analogous time-history accelerograms with their corresponding spectra. The recommendations apply specifically to the Dryden site and should not be extrapolated to other sites with varying foundation and geologic conditions or different seismic environments. Author

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography.*

N86-14707 Nebraska Univ., Lincoln.
MONITORING WATER STRESS IN SOYBEANS WITH REMOTE SENSING TECHNIQUES Ph.D. Thesis
Tantryavahi Venkata Ramana Rao 1985 196 p
Avail: Univ. Microfilms Order No. DA8516880

Studies were conducted during 1982 and 1983 on two isolines of Harosoy cultivar differing in pubescence density (dense and normal) under two different water treatments (full irrigation and no irrigation) to determine the effect of moisture on agronomic parameters, canopy temperature and canopy reflectance. The major objectives of this study were: (1) to develop prediction models for estimating canopy agronomic parameters (such as leaf area) which minmize the influence of soil background but which respond in a relatively sensitive manner to crop development, and (2) to determine, for the dense and normal pubescence soybeans, how

the diurnal changes in insolation affect the canopy temperature and canopy reflectance characteristics in the Thematic Mapper (TM) wavebands under stressed and nonstressed conditions. Vegetation indices for estimating leaf area are presented and evaluated. Dissert. Abstr.

N86-14708 Pennsylvania State Univ., University Park.
REMOTE SENSING OF PLANT CANOPY STRUCTURE WITH SIMPLE RADIATION MEASUREMENTS Ph.D. Thesis
Steven Gerard Perry 1985 200 p
Avail: Univ. Microfilms Order No. DA8516082

A technique for indirectly sensing plant canopy structure from simple, manageable measurements of direct sunlight penetrating the canopy is described. An integral relationship between the fraction of direct sunlight penetrating the canopy and canopy structural parameters is derived. Three inversion techniques for solving the canopy integral equation are described. These include the Chahine nonlinear iterative technique, the Twomey-Phillips least-squares constrained-linear inversion technique, and a previously unpublished method labeled the simple constrained-linear inversion technique. Each technique is thoroughly tested with simulated measurements which characterize data that would be taken in a wide range of actual plant canopies. For testing the indirect sensing technique with actual measurements, a field study was conducted in two hybrids corn. Dissert. Abstr.

N86-14709*# California Univ., Santa Barbara. Computer Systems Lab.
LANDSAT-D INVESTIGATIONS IN SNOW HYDROLOGY Final Report
Jeff Dozier, Principal Investigator, Robert E. Davis, Ralph O. Dubayah, James E. Frew, Shusun Li, Danny Marks, Ralph F. Milliff, Denise D. Rousseau, and Zheng-ming Wan 1985 111 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(Contract NAS5-27463)
(E86-10007; NASA-CR-176379; NAS 1.26:176379) Avail: NTIS HC A06/MF A01 CSCL 08H

Work undertaken during the contract and its results are described. Many of the results from this investigation are available in journal or conference proceedings literature - published, accepted for publication, or submitted for publication. For these the reference and the abstract are given. Those results that have not yet been submitted separately for publication are described in detail. Accomplishments during the contract period are summarized as follows: (1) analysis of the snow reflectance characteristics of the LANDSAT Thematic Mapper, including spectral suitability, dynamic range, and spectral resolution; (2) development of a variety of atmospheric models for use with LANDSAT Thematic Mapper data. These include a simple but fast two-stream approximation for inhomogeneous atmospheres over irregular surfaces, and a doubling model for calculation of the angular distribution of spectral radiance at any level in an plane-parallel atmosphere; (3) incorporation of digital elevation data into the atmospheric models and into the analysis of the satellite data; and (4) textural analysis of the spatial distribution of snow cover. Author

N86-14710*# ECON, Inc., Princeton, N.J.
COMMERCIALIZATION OF THE LAND REMOTE SENSING SYSTEM: AN EXAMINATION OF MECHANISMS AND ISSUES
J. Kevin Cauley, Carole Gaelick, Joel S. Greenberg, John Logsdon, and Tracie Monk 1 Apr. 1983 146 p refs ERTS
(Contracts NASw-3339; NA-83-SAC-00658)
(E86-10008; NASA-CR-176337; NAS 1.26:176337; ECON-82-175) Avail: NTIS HC A07/MF A01 CSCL 05A

In September 1982 the Secretary of Commerce was authorized (by Title II of H.R. 5890 of the 97th Congress) to plan and provide for the management and operation of the civil land remote sensing satellite systems, to provide for user fees, and to plan for the transfer of the ownership and operation of future civil operational land remote sensing satellite systems to the private sector. As part of the planning for transfer, a number of approaches were to be compared including wholly private ownership and operation of the system by an entity competitively selected, mixed government/private ownership and operation, and a legislatively-chartered privately-owned corporation. The results of an analysis and comparison of a limited number of financial and organizational approaches for either transfer of the ownership and operation of the civil operational land remote sensing program to the private sector or government retention are presented. Author

N86-14711*# Purdue Univ., West Lafayette, Ind. Lab. for Applications of Remote Sensing.
VEGETATION AND SOILS FIELD RESEARCH DATA BASE: EXPERIMENT SUMMARIES
L. L. Biehl, C. S. T. Daughtry, and M. E. Bauer Dec. 1984 24 p refs Revised ERTS
(Contract NAS9-16528)
(E86-10010; NASA-CR-171894; NAS 1.26:171894; LARS-TR-042382) Avail: NTIS HC A02/MF A01 CSCL 05B

Understanding of the relationships between the optical, spectral characteristics and important biological-physical parameters of earth-surface features can best be obtained by carefully controlled studies over fields and plots where complete data describing the condition of targets are attainable and where frequent, timely spectral measurement can be obtained. Development of a vegetation and soils field research data base was initiated in 1972 at Purdue University's Laboratory for Applications of Remote Sensing and expanded in the fall of 1974 by NASA as part of LACIE. Since then, over 250,000 truck-mounted and helicopter-borne spectrometer/multiband radiometer observations have been obtained of more than 50 soil series and 20 species of crops, grasses, and trees. These data are supplemented by an extensive set of biophysical and meteorological data acquired during each mission. The field research data form one of the most complete and best-documented data sets acquired for agricultural remote sensing research. Thus, they are well-suited to serve as a data base for research to: (1) quantiatively determine the relationships of spectral and biophysical characteristics of vegetation, (2) define future sensor systems, and (3) develop advanced data analysis techniques. Author

N86-14712*# National Marine Fisheries Service, Miami, Fla. Southeast Fisheries Center.
UTILIZING REMOTE SENSING OF THEMATIC MAPPER DATA TO IMPROVE OUR UNDERSTANDING OF ESTUARINE PROCESSES AND THEIR INFLUENCE ON THE PRODUCTIVITY OF ESTUARINE-DEPENDENT FISHERIES Semiannual Progress Report
Joan A. Browder, Principal Investigator, Alan Rosenthal, L. Nelsion May, Jr. (Louisiana State Univ., Baton Rouge), Robert H. Bauman (Louisiana State Univ., Baton Rouge), and James G. Gosselink (Louisiana State Univ., Baton Rouge) 10 Dec. 1985 17 p refs ERTS
(NASA Order S-56107-D)
(E86-10013; NASA-CR-176406; NAS 1.26:176406; SAPR-1) Avail: NTIS HC A02/MF A01 CSCL 08B

The purpose of the project is to refine and validate a probabilistic spatial computer model through the analyses of thematic mapper imagery. The model is designed to determine how the interface between marshland and water changes as marshland is converted to water in a disintegrating marsh. Coastal marshland in Louisiana is disintegrating at the rate of approximately 40 sq mi a year, and an evaluation of the potential impact of this loss on the landings of estuarine-dependent fisheries is needed by fisheries managers. Understanding how marshland-water interface changes as coastal marshland is lost is essential to the process of evaluating fisheries effects, because several studies suggest that the production of estuarine-dependent fish and shellfish may be more closely related to the interface between marshland and water than to acreage of marshland. The need to address this practical problem has provided an opportunity to apply some scientifically interesting new techniques to the analyses of satellite imagery. Progress with the development of these techniques is the subject of this report. Author

N86-14713# American Univ., Washington, D. C. Foreign Area Studies.
AREA HANDBOOK SERIES. MOZAMBIQUE: A COUNTRY STUDY 3RD Edition
H. D. Nelson 1985 371 p Supersedes DA-PAM-550-64 dated, 1977, AD-A048572
(AD-A157951; DA-PAM-550-64) Avail: NTIS HC A16/MF A01 CSCL 08/7

This paper presents a compact and objective exposition of the country's dominant social, economic, political and national security institutions. Particular attention is given to the origins and traditions of the people who make up the society, their dominant beliefs and values and their attitudes toward the social system and political order within which they live. B.W.

N86-14714# Army Engineer Topographic Labs., Fort Belvoir, Va.
TEXTURE ANALYSIS AND CARTOGRAPHIC FEATURE EXTRACTION
R. S. Rand Jan. 1985 45 p Original contains color illustrations
(DA Proj. 4A7-62707-A-855)
(AD-A159220; ETL-0370) Avail: NTIS HC A03/MF A01 CSCL 08/2

Investigations into using various image descriptors as well as developing interactive feature extraction software on the Digital Image Analysis Laboratory (DIAL) have culminated in a revised procedure to test statistical classification methods. An interactive experiment using this procedure was performed and showed that of the image descriptors tested, the most significant was a two component vector derived from an average and a standard deviation measure of gray shades. The texture measures failed to deliver any increase in performance for the classifier. In general, this report shows that statistical classification methods are insufficient by themselves to deliver the performance needed in a semi-automated cartographic feature extraction system. GRA

N86-14715# Wyoming Univ., Laramie. Dept. of Geology and Geophysics.
GEOTHERMAL RESOURCES OF THE GREEN RIVER BASIN, WYOMING, INCLUDING THERMAL DATA FOR THE WYOMING PORTION OF THE THRUST BELT
S. A. Spencer, H. P. Heasler, and B. S. Hinckley 1985 66 p refs
(Contract DE-FC07-79ID-12026)
(DE85-016970; DOE/ID-12026/T13) Avail: NTIS HC A04/MF A01

The geothermal resources of the Green River basin were investigated. Oil-well bottom-hole temperatures, thermal logs of wells, and heat flow data have been interpreted within a framework of geologic and hydrologic constraints. Basic thermal data, which includes the background thermal gradient and the highest recorded temperature and corresponding depth is tabulated. It was concluded that large areas are underlain by water at temperatures greater than 120 F. Although much of this water is too deep to be economically tapped solely for geothermal use, oil and gas wells presently provide access to this significant geothermal resource. Isolated areas with high temperature gradients exist. These areas - many revealed by hot springs - represent geothermal systems which might presently be developed economically. DOE

N86-14716# Louisiana State Univ., Baton Rouge. Dept. of Geology.
GEOLOGIC, GEOPHYSICAL, AND GEOCHEMICAL ASPECTS OF SITE-SPECIFIC STUDIES OF THE GEOPRESSURED-GEOTHERMAL ENERGY RESOURCE OF SOUTHERN LOUISIANA Final Report
R. H. Pilger, Jr., ed. 1985 241 p
(Contract DE-AC08-79ET-27019)
(DE85-016911; DOE/ET-27019/1) Avail: NTIS HC A11/MF A01

The report consists of four sections dealing with progress in evaluating geologic, geochemical, and geophysical aspects of geopressured-geothermal energy resources in Louisiana. Separate abstracts have been prepared for the individual sections. DOE

N86-14717# Geological Survey, Denver, Colo.
URANIUM-SERIES DATING OF SECONDARY CARBONATE AND SILICA PRECIPITATES RELATING TO FAULT MOVEMENTS IN THE NEVADA TEST SITE REGION AND OF CALICHE AND TRAVERTINE SAMPLES FROM THE AMARGOSA DESERT
B. J. Szabo and P. A. OMalley 1985 15 p refs
(Contract DE-AI08-78ET-44802)
(DE85-013083; USGS-OFR-85-47) Avail: NTIS HC A02/MF A01

Fault associated secondary carbonate and opal samples from the Nevada Test Site area together with travertine samples from the Amargosa Desert were dated by the uranium series disequilibrium method. Analyses of secondary carbonate samples from Yucca Mountain and from Crater and Yucca Flats yielded minimum ages for the last significant displacements of associated faults between 27,000 and 219,000 years. Dating results of an opaline carbonate rock sample from a fault on the east side of Yucca Mountain indicate that the age of the deposit is greater than 360,000 years. Two dates of travertine vein samples show that spring discharge was occurring before 360,000 years ago in the Kinney area of the Amargosa Desert. Ages obtained for travertine laminae from the Furnace Creek Wash area suggest that significant movement along this low-angle fault occurred more than 132,000 years ago. DOE

N86-14718# Technische Univ., Hanover (West Germany). Fachrichtung Vermessungswesen.
THREE-DIMENSIONAL ADJUSTMENT OF TERRESTRIAL AND SATELLITE OBSERVATIONS Ph.D. Thesis [ZUR DREIDIMENSIONALEN AUSGLEICHUNG VON TERRESTRISCHEN UND SATELLITENBEOBACHTUNGEN]
Manfred Bauemker 1984 151 p refs In GERMAN
(Wiss-Arb-Vermessungswesen-130; ISSN-0174-1454) Avail: NTIS HC A08/MF A01

A three-dimensional adjustment model for large networks, taking into account geometric and physical observation data, especially satellite Doppler coordinates, is presented. The observations were performed in a 140,000 sq km network containing 196 stations. Two and three dimensional adjustment models are presented. Data acquisition, examinations of horizontal direction, route, height, and satellite Doppler networks are discussed. An astrogeodetic method for geoid determination, followed by an iterative collating model for the calculation of geoid heights for the network points, is presented. A stochastic model is also discussed. Author (ESA)

N86-14719# National Aerospace Lab., Amsterdam (Netherlands). Space Div.
REVIEW OF MODELS AND MEASUREMENTS OF MULTISPECTRAL REFLECTANCE BY PLANT CANOPIES. RECOMMENDATIONS FOR FUTURE RESEARCH
N. J. J. Bunnik 4 Oct. 1984 14 p refs Presented at SPIE Technical Symposium East 1984 Conference 475: Critical Reviews on Remote Sensing, Arlington, Georgia, 1-2 May 1984
(NLR-MP-84039-U; B8566809) Avail: NTIS HC A02/MF A01

Remote sensing applications of vegetation canopy reflectance models based on the one-dimensional radiative transfer equation, and models based on radiative transfer within a finite number of uniform layers are discussed. Canopy reflectance measurement examples concerning cause-effect relationships, non-Lambertian reflectance, model verification, crop yield estimation and the assessment of the influence of the atmosphere and the observation geometry are given. Recommendations for research on crop growth monitoring, model inversion, and application of atmospheric correction models are made. The effect of the polarization of scattered radiation should be also investigated in relation to the increased interest in data acquisition under varying view angles. Author (ESA)

N86-14720# District of Columbia Univ., Washington, D. C. Water Resources Research Center.
GROUNDWATER PROBLEMS IN THE MID-ATLANTIC FALL LINE CITIES Report for Oct. 1983 - Sep. 1984
M. H. Watt, J. V. OConnor, H. V. Troung, and W. D. Marks Sep.

1984 81 p
(Grant DI-14-08-0001-G-834)
(PB85-225985; DC/WRRC-62; USGS/G-834-02) Avail: NTIS HC A05/MF A01 CSCL 08H

Little attention has been given to the groundwater regime of the major cities of the Fall Zone. The cities that lie along the Fall Zone are referred to as Fall-Line cities (e.g., Philadelphia, Wilmington, Baltimore, Washington, and Richmond). There are a number of problems related to groundwater underlying urban areas. These are related to the construction, tunneling, and history of land use activities. An understanding of the groundwater situation of the Fall-Line cities is developed. GRA

N86-14721# District of Columbia Univ., Washington, D. C. Water Resources Research Center.
DISTRICT OF COLUMBIA WATER RESOURCES RESEARCH CENTER, FY 1983 Final Institute Program Report
M. H. Watt Sep. 1984 46 p
(Grant DI-14-08-0001-G-834)
(PB85-226009; DC/WRRC-60; USGS/G-834-01) Avail: NTIS HC A03/MF A01 CSCL 08H

The FY 83 Institute Final Program Report presents the completed and continuing projects that the D.C. Water Resources Research Center conducted between August 1, 1983 and September 30, 1984. The projects are: (1) Evaluation of the Impact of Urbanization the Hydrogeological Conditions of the Fall-Line Cities; (2) Development of Frequency Functions for Urban Non-Point Risk Evaluation; (3) Derivation of Unit-Day-Values for Recreation Benefit Valuation in Water Resource Planning Based on a Comprehensive Theoretical Framework; (4) Identification and Priorization of the Water Resources Problems and Research Needs in the District of Columbia; and (5) Model of Flow and Non-Point Source Pollution in the Tidal Portion of the Potomac River. GRA

N86-14722# National Geodetic Survey, Rockville, Md.
ORTHOMETRIC HEIGHT DETERMINATION USING GPS (GLOBAL POSITIONING SYSTEM) OBSERVATIONS AND THE INTEGRATED GEODESY ADJUSTMENT MODEL
G. W. Hein Apr. 1985 22 p refs
(PB85-198919; NOAA-TR-NOS-110; NGS-32) Avail: NTIS HC A02/MF A01 CSCL 08C

An integrated geodesy adjustment is presented for the determination of orthometric height differences using observations of the satellites of the Global Positioning System (GPS) in combination with all available terrestrial observations. In particular, linear (pseudo-) observation equations for orthometric heights and the GPS base-line components are developed which allow for the consideration of noise in both data types. Author (GRA)

N86-14723# National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Environmental Research Lab.
TECHNICAL PLAN FOR THE GREAT LAKES ENVIRONMENTAL RESEARCH LABORATORY
Jan. 1985 89 p
(PB85-212983) Avail: NTIS HC A05/MF A01 CSCL 08H

The Technical Plan documents the GLERL research program as of December 1984. The version of the Technical Plan outlines both the projects and tasks. An evolution of the research structure has occurred and is continuing. The critical nature of the toxic organic problem in the Great Lakes, the urgency in its own right and interdependencies of the nutrient enrichment (eutrophication) problem to the Great Lakes ecosystem, and the critical need to develop improved methods of environmental prediction and simulation for resource development and use and for environmental protection is reflected in Projects 1, 3, 4, 5, 6, and 10. The evolving research plans addressing lake levels, flows, and water quantity management problems are documented in Projects 7 and 10. The research plans for improved information and methods of prediction of physical hazards, waves, storm surges, and lake ice are documented in Projects 2 and 8. GRA

N86-14724# Oklahoma State Univ., Stillwater.
PLUME2D: TWO-DIMENSIONAL PLUMES IN UNIFORM GROUND WATER FLOW Final Report, Sep. 1983 - Feb. 1985
J. Wagner, S. A. Watts, and D. C. Kent Jun. 1985 93 p
(Grant EPA-R-811142)
(PB85-214450; EPA-600/W-85-065) Avail: NTIS HC A05/MF A01 CSCL 08H

A closed form analytical solution for two dimensional plumes were incorporated in an interactive computer program. The assumption of an infinite aquifer depth and uniform source mass rate and source location was overcome by using the principal of superposition in space and time. The source code was written in a subset of FORTRAN 77 and can be compiled with FORTRAN IV, FORTRAN 66 as well as FORTRAN 77. As a result, the code is nearly independent of hardware and operating system. The model can be solved for either vertically or horizontally averaged conditions. GRA

N86-14725# Kentucky Water Resources Research Inst., Lexington.
FINITE ELEMENT SIMULATION OF SATURATED-UNSATURATED SUBSURFACE FLOW Research Report, Jul. 1983 - Aug. 1984
G. E. Blandford Aug. 1985 74 p
(PB85-214658; USGS/G-844(03)) Avail: NTIS HC A04/MF A01 CSCL 08H

A two dimensional transient model for flow through saturate-unsaturated porous media is developed. The model numerically solves the pressure head dependent or moisture content dependent form of Richard's equations. The model code uses isoparametric quaddratic triangular and/or quadrilateral finite elements for the geometric representation and for the weak Galerkin spacial integrations. An implicit, unconditionally stable single step numerical time integration scheme with an oscillatory noise reduction option is utilized for the temporal discretization. The highly efficient symmetric skyline solution scheme is used to solve the resulting simultaneous equations. The nonlinear subsurface flow parameters are approximated using cubic spline interpolation. The element material properties can be independently defined thus permitting the modelling of layered geologic formations. Several sample problems are presented illustrating the accuracy and validity of the developed model. GRA

N86-14726# Geological Survey, St. Paul, Minn. Water Resources Div.
WATER RESOURCES DATA FOR MINNESOTA, WATER YEAR 1983. VOLUME 1: GREAT LAKES AND SOURIS-RED-RAINY RIVER BASINS Annual Report, 1 Oct. 1982 - 30 Sep. 1983
K. T. Gunard, J. H. Hess, J. L. Zirbel, and C. E. Cornelius Feb. 1985 214 p Prepared in cooperation with Minnesota Dept. of Transportation, St. Paul and Minnesota Dept. of Natural Resources, St. Paul, Minnesota
(PB85-215986; USGS/WRD/HD-85/214; USGS/WRD/MN-83/1) Avail: NTIS HC A10/MF A01 CSCL 08H

Water-resources data for the 1983 water year for Minnesota consist of records of stage, discharge and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality in wells and springs. The volume contains discharge records for 52 gaging stations; stage-only records for 1 gaging station; stage and contents for 5 lakes and reservoirs; water quality for 16 gaging stations, 1 stage station, 14 partial-record stations, and 18 wells; and water levels for 42 observation wells. Also included are 43 high-flow partial-record stations. GRA

N86-14932# Aeronautical Research Associates of Princeton, Inc., N. J.
AN ANALYTICAL MODEL OF PERIODIC WAVES IN SHALLOW WATER, SUMMARY
H. Segur and A. Finkel *In* ARO Transations of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 459-470 Previously announced as N85-16086 (For primary document see N86-14902 05-59)
(AD-P004932) Avail: NTIS HC A99/MF E03 CSCL 12/1

N86-14937# Defence Research Establishment Valcartier (Quebec).
MIGRATION OF THE GAS GLOBE FROM UNDERWATER EXPLOSIONS: THE EFFECTS OF DRAG AND RADIATIVE ENERGY LOSS
K. C. Heaton *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 535-583 (For primary document see N86-14902 05-59)
(AD-P004937) Avail: NTIS HC A99/MF E03 CSCL 12/1

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N86-14727*# Case Western Reserve Univ., Cleveland, Ohio.
COMBUSTOR FLAME FLASHBACK Final Report
Margaret P. Proctor and James S. Tien Jun. 1985 82 p refs (Grant NAG3-290; Contract DE-AI01-77CS-51040)
(NASA-CR-174961; DOE/NASA/0290-1; NAS 1.26:174961) Avail: NTIS HC A05/MF A01 CSCL 10B

A stainless steel, two-dimensional (rectangular), center-dump, premixed-prevaporized combustor with quartz window sidewalls for visual access was designed, built, and used to study flashback. A parametric study revealed that the flashback equivalence ratio decreased slightly as the inlet air temperature increased. It also indicated that the average premixer velocity and premixer wall temperature were not governing parameters of flashback. The steady-state velocity balance concept as the flashback mechanism was not supported. From visual observation several stages of burning were identified. High speed photography verified upstream flame propagation with the leading edge of the flame front near the premixer wall. Combustion instabilities (spontaneous pressure oscillations) were discovered during combustion at the dump plane and during flashback. The pressure oscillation frequency ranged from 40 to 80 Hz. The peak-to-peak amplitude (up to 1.4 psi) increased as the fuel/air equivalence ratio was increased attaining a maximum value just before flashback. The amplitude suddenly decreased when the flame stabilized in the premixer. The pressure oscillations were large enough to cause a local flow reversal. A simple test using ceramic fiber tufts indicated flow reversals existed at the premixer exit during flickering. It is suspected that flashback occurs through the premixer wall boundary layer flow reversal caused by combustion instability. A theoretical analysis of periodic flow in the premixing channel has been made. The theory supports the flow reversal mechanism.
R.J.F.

N86-14728# Physikalisch-Technische Bundesanstalt, Brunswick (West Germany). Abt. Optik.
SOLAR ELEMENTS: MEASURING TECHNIQUES AND PHYSICAL FUNDAMENTALS [SOLARELEMENTEN - MESSTECHNIK UND PHYSIKALISCHE GRUNDLAGEN]
Dietrich Hahn, ed., Heinrich Kaase, ed., and Juergen Metzdorf, ed. Oct. 1984 282 p refs Partly in GERMAN and ENGLISH Presented at 60th Physik.-Tech. Bundesanstalt Seminar, Brunswick, 10-11 Oct. 1984 Sponsored by Helmholtz-Fonds e.v.
(PTB-Opt-17; ISSN-0341-6712) Avail: NTIS HC A13/MF A01

The significance of photovoltaics for energy production, the losses of extraterrestrial solar radiation in the atmosphere, the possibilities of solar simulation, and the use of radiometric standards and pyranometers are treated. The calibration of solar elements, and the electrical performance calibration of space solar cells and panels are presented. The effect of bulk materials properties on the efficiency of solar cells; determination of characteristic parameters of multicrystalline silicon solar cells; the effect of grain boundaries on the electrical properties of polycrystalline silicon solar elements; and the photoinduced effects on crystalline silicon solar elements are discussed. The manufacturing of solar silicon and solar cells, and the mechanism of solar cells made of amorphous silicon are treated. Electrical and optical measurements on hydrogenated amorphous silicon diodes were performed. The physical properties of GaAs solar elements, and the photovoltaic properties of Cu2S-CdS thin-film solar elements are discussed. For individual titles, see N86-14729 through N86-14745.

N86-14729# Kernforschungsanlage, Juelich (West Germany).
THE SIGNIFICANCE OF PHOTOVOLTAICS FOR ENERGY PRODUCTION [BEDEUTUNG DER PHOTOVOLTAIK FUER DIE ENERGIEGEWINNUNG]
K. Ullrich *In* Physik.-Tech. Bundesanstalt Solar Elements: Measuring Tech. and Physical Fundamentals Oct. 1984 p 4-10 In GERMAN (For primary document see N86-14728 05-44)
Avail: NTIS HC A13/MF A01

Industry-relevant development trends in photovoltaics are discussed. For crystalline Si the emphasis in on the development of production-friendly methods and of user-specific economical modules. For amorphous Si development priorities are higher efficiency, understanding of degradation mechanisms, and larger surfaces. For CdS/Cu2S the emphasis is on the understanding of the harmful properties of the heterogeneous structure, and on the fabrication of a competitive product. The present energy production applications of photovoltaic modules are energy-economically meaningless. The trend towards higher solar cell efficiencies (> 25%) and increasingly stringent environmental criteria are promising for photovoltaic energy supplies. Author (ESA)

N86-14730# Deutscher Wetterdienst, Hamburg (West Germany).
THE EXTRATERRESTRIAL SOLAR SPECTRUM AND ITS CHANGE IN THE ATMOSPHERE [DAS EXTRATERRESTRISCHE SONNENSPEKTRUM UND SEINE VERAENDERUNG IN DER ATMOSPHERE] c47
F. Kasten *In* Physik.-Tech. Bundesanstalt Solar Elements: Measuring Tech. and Physical Fundamentals Oct. 1984 p 11-38 refs In GERMAN (For primary document see N86-14728 05-44)
Avail: NTIS HC A13/MF A01

Radiation losses in the atmosphere were investigated to determine the extraterrestrial solar spectrum from the Earth surface. The World Meteorological Organization solar spectrum is presented. The variations observed in the solar constant are discussed. The radiation transfer equation for solar radiation in the atmosphere and the extinction of solar radiation by scattering and absorption in the atmosphere are given. The parameterization of the single extinction contribution is explained. The part of the scattered solar radiation reaching the Earth as diffuse solar radiation, and the global radiation per horizontal unit of surface are given. The exact treatment of the radiation transfer in the atmosphere is explained. Measured spectral distributions are shown. It is shown how cloudiness is taken into account in a radiation transfer model. Author (ESA)

N86-14731# Bundesanstalt fuer Materialpruefung, Berlin (West Germany).
POSSIBILITIES OF SOLAR SIMULATION [MOEGLICHKEITEN DER SONNENSIMULATION] c92
D. Gundlach *In* Physik.-Tech. Bundesanstalt Solar Elements: Measuring Tech. and Physical Fundamentals Oct. 1984 p 39-48 In GERMAN (For primary document see N86-14728 05-44)
Avail: NTIS HC A13/MF A01

The simulation of the spectral distribution and absolute strength of direct and indirect solar radiation was examined. It is shown that an appropriate combination of radiation sources, optical paths, filters, and selective layers enables the simulation of direct and indirect solar radiation. The simulation of directed solar radiation requires an important effort. Simulators for diffuse radiation are much easier to realize, without additional spectral adaptation. For the determination of the efficiency of solar elements the

quality of spectral adaptation has to be emphasized. However, this is only possible with limitations, imposing the determination of the effective simulator radiation strength for a given spectral type of solar element. Pulsed solar simulators are not treated since it is not proven that the results are equal to those of continuously operating simulators or natural solar radiation. Author (ESA)

N86-14732# Physikalisch-Technische Bundesanstalt, Brunswick (West Germany).
FUNDAMENTALS OF RADIOMETRY [GRUNDLAGEN DER RADIOMETRIE] c92
K. D. Stock *In its* Solar Elements: Measuring Tech. and Physical Fundamentals Oct. 1984 p 49-62 refs In GERMAN (For primary document see N86-14728 05-44)
Avail: NTIS HC A13/MF A01

Primary radiometric standards chosen with a view to the user of solar elements are presented. The developed Planck radiator has a 10 mm diameter aperture and consists of graphite cylinders with a total length of 35 cm. In the visible range a relative measuring uncertainty of 1.5% is found. The primary receiver standards for low and high (a few solar constants) radiation strength are described. The absorption degree of the former is almost 1, its spectral sensitivity is constant; and the calibration uncertainty of a radiometric scale based on this receiver is + or - 0.2%; for the latter this uncertainty is + or - 0.3%. The calibration uncertainty of radiation standards for radiation strength (global radiation) is 0.5%. The uncertainty of standards for spectral radiation strength is 2% in the visible and 3% in the IR spectrum. The calibration of selective and unselective user receiver standards is described. The use of photoelements as a selective user standard is discussed. Author (ESA)

N86-14733# Deutscher Wetterdienst, Hamburg (West Germany).
MEASURING CHARACTERISTICS OF PYRANOMETERS [MESSEIGENSCHAFTEN VON PYRANOMETERN] c35
K. Dehne *In* Physik.-Tech. Bundesanstalt Solar Elements: Measuring Tech. and Physical Fundamentals Oct. 1984 p 63-89 refs In GERMAN (For primary document see N86-14728 05-44)
Avail: NTIS HC A13/MF A01

Construction and measuring characteristics of pyranometers are reviewed. The basic design of the main pyranometer types and their modus operandi are described. The physical measuring process in a pyranometer is explained in order to clarify the physical background of the measuring properties. The measuring characteristics of pyranometers, such as adjustment behavior, sensitivity, long term drift, temperature effects, nonlinearity, dependence on the incidence angle, azimuthal angle effect, dependence on the inclination angle of the pyranometer setup, spectral selectivity, and polarization effect are discussed. The global measuring uncertainty can only be estimated for precisely defined measuring conditions. Author (ESA)

N86-14734# Physikalisch-Technische Bundesanstalt, Brunswick (West Germany).
CALIBRATION OF SOLAR ELEMENTS [KALIBRIERUNG VON SOLARELEMENTEN]
H. Kaase and J. Metzdorf *In its* Solar Elements: Measuring Tech. and Physical Fundamentals Oct. 1984 p 90-102 refs In GERMAN (For primary document see N86-14728 05-44)
Avail: NTIS HC A13/MF A01

The calibration of photovoltaic solar elements is discussed. For the calibration an estimated energy conversion efficiency has to be determined under standardized solar radiation strength conditions; the requirements for that measurement are given. The measuring method of differential spectral sensitivity, and the direct calibration method and its problem of spectral mismatch are explained. Measuring results show the importance of standardized solar radiation strengths. The reproducibility of the direct method is significantly worse. The absolute accuracy can only be determined after extensive measurements to correct the spectral mismatch. Author (ESA)

N86-14735# European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands).
ELECTRICAL PERFORMANCE CALIBRATION OF SPACE SOLAR CELLS AND PANELS
K. Bogus, J. C. Larue, and A. Robben *In* Physik.-Tech. Bundesanstalt Solar Elements: Measuring Tech. and Physical Fundamentals Oct. 1984 p 103-123 refs (For primary document see N86-14728 05-44)
Avail: NTIS HC A13/MF A01

Commonly used performance tests of solar cells and solar cell modules covering indoor and natural sunlight methods are reviewed. The historical and rational background of these methods is depicted and the experience gained at ESA/ESTEC in the framework of space and terrestrial programs is described. The general objectives and requirements of performance tests (classification of photovoltaic measurements, photovoltaic measurement requirements), indoor measurement methods (steady state solar simulator with reference cells, pulsed solar simulator with reference cells), and solar cell reference standards (calibration by balloon or aircraft at high altitude, calibration on ground in natural sunlight, calibration in space) are presented. Author (ESA)

N86-14736# Joint Research Centre of the European Communities, Ispra (Italy).
CALIBRATION METHODS FOR SOLAR ELEMENTS: AN EXPERIMENTAL COMPARISON
H. Ossenbrink, R. vonSteenwinkel, and H. Lang *In* Physik.-Tech. Bundesanstalt Solar Elements: Measuring Tech. and Physical Fundamentals Oct. 1984 p 124-144 (For primary document see N86-14728 05-44)
Avail: NTIS HC A13/MF A01

Calibration techniques to determine the efficiency of photovoltaic systems are reviewed. Indoor calibration methods (measurements of absolute spectral responsivity, calibration with solar simulators), and outdoor methods (calibration using direct sunlight, calibration using global sunlight, measurement and analysis procedure) are described. Based on extensive test series of silicon solar cells of different kinds, an experimental comparison of four calibration methods, with emphasis on their experimental complexity and precision, is presented. Author (ESA)

N86-14737# Heliotronic G.m.b.H., Burghausen (West Germany).
CORRELATION BETWEEN THE BULK PROPERTIES OF MONOCRYSTALLINE AND POLYCRYSTALLINE SILICON SOLAR ELEMENTS AND EFFICIENCY [ZUSAMMENHANG DER VOLUMENEIGENSCHAFTEN VON MONOKRISTALLINEN BZW. POLYKRISTALLINEN SI-SOLARELEMENTEN UND WIRKUNGSGRAD]
P. Wagner *In* Physik.-Tech. Bundesanstalt Solar Elements: Measuring Tech. and Physical Fundamentals Oct. 1984 p 145-163 refs In GERMAN (For primary document see N86-14728 05-44)
Avail: NTIS HC A13/MF A01

The effect of bulk materials properties on the efficiency of solar cells was investigated. Electrical characteristics and parameters of solar cells, and the Shockley-Read-Hall recombination model are presented. Recombination-active defects were characterized in poly-Si. Point defects, point defect clusters, precipitates, and line defects are discussed. In poly-Si interactions between all these defects (plus grain boundaries) can occur, making possible a mutual compensation of the recombination-active centers. Author (ESA)

N86-14738# Telefunken Electronic G.m.b.H., Heilbronn (West Germany).
PROBLEMS IN THE DETERMINATION OF CHARACTERISTIC PARAMETERS OF MULTICRYSTALLINE SILICON SOLAR CELLS [PROBLEME BEI DER BESTIMMUNG CHARAKTERISTISCHER PARAMETER MULTIKRISTALLINER SILICIUMSOLARZELLEN]
W. Schmidt *In* Physik.-Tech. Bundesanstalt Solar Elements: Measuring Tech. and Physical Fundamentals Oct. 1984 p 164-175 refs In GERMAN (For primary document see N86-14728 05-44)
Avail: NTIS HC A13/MF A01

The measuring difficulties encountered in the determination of

the characteristic parameters of solar cells made of multicrystalline Si are discussed. The dark curve often allows only an inaccurate determination of the diode parameters; conclusions about material dependent effects are only partially possible. In brightness curve measurement the problem of the use of the correct (simulated) solar spectrum arises. The measurement of an effective diffusion length in multicrystalline solar cells only allows relative statements; several alternative methods have to be tested. The effect of light intensity on diffusion length, on the curve factor and on the open circuit voltage, leads to discrepancies between the values obtained under measuring and utilization conditions. The replacement of the measurement of maximum power by that of the power averaged over the day is recommended, although no suitable and economical measuring method exists.

Author (ESA)

N86-14739# Technische Univ., Berlin (West Germany). Inst. fuer Werkstoffe der Electronik.

THE EFFECT OF GRAIN BOUNDARIES ON THE ELECTRICAL PROPERTIES OF POLYCRYSTALLINE SILICON SOLAR ELEMENTS [EINFLUSS VON KORNGRENZEN AUF DIE ELEKTRISCHEN EIGENSCHAFTEN VON POLYKRISTALLINEN SILIZIUM SOLARELEMENTEN]

M. Boehm, H. C. Scheer, and H.-G. Wagemann *In* Physik.-Tech. Bundesanstalt Solar Elements: Measuring Tech. and Physical Fundamentals Oct. 1984 p 176-187 refs In GERMAN (For primary document see N86-14728 05-44)

Avail: NTIS HC A13/MF A01

The effect of grain boundaries on the electrical properties of solar cells made of polycrystalline silicon is treated using a model calculation for single microcrystals. For the calculation of the spectral sensitivity and the characteristic curves in white light, a boundary value problem has to be solved, in the mathematical definition of which the grain boundary is formally taken into account in the form of a grain boundary recombination velocity. The calculation results show that bad grain boundaries become apparent by a reduction and a blue shift of the sensitivity. Detailed statements are only possible after a physical description of the phenomena directly in the grain boundary. It is shown that the grain boundary recombination velocity is reduced in a characteristic way during injection (e.g., due to radiation of light). This effect is observed by a nonlinearity of the sensibility of certain polycrystalline solar cells. Theoretical results agree well with the measurements.

Author (ESA)

N86-14740# Physikalisch-Technische Bundesanstalt, Brunswick (West Germany).

PHOTOINDUCED EFFECTS ON THE BASIS OF CRYSTALLINE SILICON SOLAR ELEMENTS [PHOTOINDUZIERTE EFFEKTE IN DER BASIS KRISTALLINER SI-SOLARELEMENTE]

J. Metzdorf and H. Kaase *In its* Solar Elements: Measuring Tech. and Physical Fundamentals Oct. 1984 p 188-201 refs In GERMAN (For primary document see N86-14728 05-44)

Avail: NTIS HC A13/MF A01

Investigations were conducted in order to characterize the basic material of crystalline Si-solar elements. The characteristics of the photoinduced increase of sensitivity (photoaugmentation), the characterization of the basic materials by an effective diffusion length (correlation between photoaugmentation and diffusion length), and the frequency-time behavior of the photoaugmentation are discussed. It is expected that the method of differential spectral sensitivity can also be applied to provide information about the energetic state and the chemical nature of traps and imperfections. For the characterization of the basic material the investigations have to be extended, especially taking into account dependence on photon energy and temperature. Author (ESA)

N86-14741# Siemens A.G., Munich (West Germany).

MANUFACTURING METHOD FOR SOLAR SILICON AND MEASURING TECHNICAL RESULTS ON CELLS MADE OF SOLAR SILICON [HERSTELLVERFAHREN VON SOLARSILIZIUM UND MESSTECHNISCHE ERGEBNISSE AN DARAUS GEFERTIGTEN ZELLEN]

H. Aulich and F. Cammerer *In* Physik.-Tech. Bundesanstalt Solar Elements: Measuring Tech. and Physical Fundamentals Oct. 1984 p 202-218 refs In GERMAN (For primary document see N86-14728 05-44)

Avail: NTIS HC A13/MF A01

Solar silicon and solar cells were manufactured. Starting from cheap solar silicon and using known methods, monocrystalline disks were manufactured which were further processed to solar cells. The solar cell production technology is explained. Measurements on the solar cells show efficiencies up to 12.2%. The average efficiency of 10.2% is lower than the 11.3% of solar cells made of classical semiconductor material, due to the lower electron diffusion length in solar silicon. Author (ESA)

N86-14742# AEG-Telefunken, Frankfurt am Main (West Germany).

MECHANISM OF SOLAR CELLS MADE OF AMORPHOUS SILICON [FUNKTIONSWEISE VON SOLARZELLEN AUS AMORPHEM SILIZIUM]

R. Fischer *In* Physik.-Tech. Bundesanstalt Solar Elements: Measuring Tech. and Physical Fundamentals Oct. 1984 p 219-230 refs In GERMAN (For primary document see N86-14728 05-44)

Avail: NTIS HC A13/MF A01

The mechanism of amorphous silicon (a-Si) solar cells is explained by comparing it with solar cells made of crystalline silicon (c-Si). The electronic properties of a-Si are different from that of c-Si cells on two points: the light-induced electron-hole pairs are separated by charge carrier drift, and the recombination of charge carriers plays an essential role. The primary photocurrent, the spatial distribution of the redundant carriers, and the electric field in the i-layer are treated. Constraints on manufacturing of a-Si solar cells are given. Author (ESA)

N86-14743# Siemens A.G., Munich (West Germany). Forschungslab.

ELECTRICAL AND OPTICAL MEASUREMENTS ON HYDROGENATED AMORPHOUS SILICON (a-Si:H) DIODES [ELEKTRISCHE UND OPTISCHE MESSUNGEN AN a-Si:H DIODEN]

W. Kruehler *In* Physik.-Tech. Bundesanstalt Solar Elements: Measuring Tech. and Physical Fundamentals Oct. 1984 p 231-241 In GERMAN (For primary document see N86-14728 05-44)

Avail: NTIS HC A13/MF A01

Measurements to determine physical properties of a-Si:H solar cells were performed for the production of high-efficiency solar cells. The state density in the band gap of a-Si:H can be determined from the measurement of the space-charge-limited currents on nin-and pip-diodes. The measurement of the spectral sensitivity of pin-diodes allows the determination of the mobility times lifetime in a-Si:H. The diffusion lengths are determined from the measurement of the surface photovoltage on Schottky contacts as a function of the wavelength. Measurement of the transit time of charge carriers in pin-diodes provide the mobility and the lifetime in separated form. Author (ESA)

N86-14744# Fraunhofer-Inst. fuer Solare Energiesysteme, Freiburg (West Germany).

CHARACTERIZATION OF GaAs SOLAR ELEMENTS: PHYSICAL FUNDAMENTALS AND MEASUREMENTS [CHARAKTERISIERUNG VON GaAs-SOLAR-ELEMENTEN- PHYSIKALISCHE GRUNDLAGEN UND MESSUNGEN]

K. Heidler and S. Kunzlemann *In* Physik.-Tech. Bundesanstalt Solar Elements: Measuring Tech. and Physical Fundamentals Oct. 1984 p 242-253 refs In GERMAN (For primary document see N86-14728 05-44)

(Contract BMFT-03E-8263-A)

Avail: NTIS HC A13/MF A01

The most important physical properties of GaAs solar elements are discussed. The manufacturing procedures for GaAs thin-film cells are presented. The measurements of voltage-current curve, efficiency, and spectral sensitivity are described. Results on the effect of white additional illumination on spectral sensitivity are given; an increase of 6.3% at 633 nm is observed on a GaAs solar element. Author (ESA)

N86-14745# Stuttgart Univ. (West Germany). Inst. fuer Physikalische Elektronik.
THE PHOTOVOLTAIC PROPERTIES OF Cu2S-CdS THIN FILM SOLAR ELEMENTS [DIE PHOTOVOLTAISCHEN EIGENSCHAFTEN VON Cu2S-CdS DUENNSCHICHTSOLARELEMENTEN]
F. Pfisterer *In* Physik.-Tech. Bundesanstalt Solar Elements: Measuring Tech. and Physical Fundamentals Oct. 1984 p 254-260 refs In GERMAN (For primary document see N86-14728 05-44) Avail: NTIS HC A13/MF A01

Measurements of the photovoltaic properties of Cu2S-CdS thin-film solar cells are discussed. Effects occurring in the photovoltaic measurements on these cells (crossover in dark and brightness curves, spectral dependence of the brightness curve, light-bias effects in the spectral sensitivity, hysteresis of voltage-current curves, thermally restorable optical degradation) are explained. Theoretical points, such as space-charge and potential distribution in pn-transitions of the cell, and current distribution in the pn-transition are discussed to explain these effects. The constraints imposed upon photoelectric measurements on Cu2S-CdS solar cells by these effects are given. Author (ESA)

N86-14746# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
REVIEW OF PHOTOVOLTAIC RESEARCH IN THE US
R. D. McConnell Aug. 1985 5 p Presented at the US/India Binational Symposium on Solar Energy Research and Applications, Roorkee, India, 5 Aug. 1985
(Contract DE-AC02-83CH-10093)
(DE85-012165; SERI/TP-216-2787; CONF-850858-3) Avail: NTIS HC A02/MF A01

US research efforts to develop new generations of photovoltaic technologies having the potential for lower cost and better performance than the older generations of crystalline silicon technologies are described. The newer generations consist primarily of single and multijunction thin film devices destined for either flat plate or concentrator photovoltaic systems. The principal sponsors for the research are the US Department of Energy, US photovoltaic companies, the Electric Power Research Institute, and those US government agencies interested in the use of photovoltaics in space. A description of future research activities in the areas of amorphous silicon, polycrystalline thin films, high efficiency concepts, and fundamental research is given. DOE

N86-14747# Department of Energy, Washington, D. C.
SHORT PROTECTION DEVICE FOR STACK OF ELECTROLYTIC CELLS Patent Application
M. Katz (United Technologies Corp., South Windsor, Conn.) and C. R. Schroll, inventor (to DOE) (United Technologies Corp., South Windsor, Conn.) Filed 29 Nov. 1984 14 p
(Contract DE-AC21-79ET-15440)
(DE85-017727; US-Patent-Appl-SN-676340) Avail: NTIS HC A02/MF A01

The present invention relates to a device for preventing the electrical shorting of a stack of electrolytic cells during an extended period of operation. The device has application to fuel cell and other electrolytic cell stacks operating in low or high temperature corrosive environments. It is of particular importance for use in a stack of fuel cells operating with molten metal arbonate electrolyte for the production of electric power. Also, the device may have application in similar technology involving stacks of electrolytic cells for electrolysis to decompose chemical compounds. DOE

N86-14748# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
CAPACITY DEGRADATION OF FIELD-TESTED SILICA GEL SAMPLES
T. R. Penney, A. A. Pesaran, and T. M. Thomas Jun. 1985 7 p Presented at the INTERSOL '85, Solar Energy: The Diverse Solution, Montreal, Canada, 23 Jun. 1985
(Contract DE-AC02-83CH-10093)
(DE85-012155; SERI/TP-252-2741; CONF-850604-13) Avail: NTIS HC A02/MF A01

Researchers at the Solar Energy Research Institute (SERI) have begun preliminary studies to quantify the effect of contamination of silica gel used in dehumidification processes of desiccant cooling systems. Sorption capacity degradation of field tested samples was measured, and the source of degradation was quantified using surface analysis experimental methods. DOE

N86-14749# Midwest Research Inst., Golden, Colo.
STATUS AND PROGRESS IN SOLAR THERMAL RESEARCH AND TECHNOLOGY
B. P. Gupta Jul. 1985 9 p Presented at the US/India BiNational Symposium on Solar Energy Research and Applications, Roorkee, India, 5 Aug. 1985
(Contract DE-AC02-83CH-10093)
(DE85-012157; SERI/TP-250-2761; CONF-850858-1) Avail: NTIS HC A02/MF A01

Substantial progress has been made in various solar thermal technologies. Components and systems have reached different states of maturity for various types of solar thermal systems. Data are now being obtained from operating systems in the United States and other countries. These data have identified the future research needed to realize the full potential of the solar resource. This paper describes the status of solar thermal technologies and progress in solar thermal research to achieve long-term performance and cost goals. DOE

N86-14750# Poly Solar, Inc., Garland, Tex.
FEASIBILITY OF USING COPPER INDIUM DISULFIDE FOR HIGH-EFFICIENCY, THIN-FILM SOLAR CELLS Annual Progress Report, 1 Nov. 1983 - 31 Jan. 1985
Jul. 1985 32 p
(Contract DE-AC02-83CH-10093)
(DE85-012173; SERI/STR-211-2731) Avail: NTIS HC A03/MF A01

This annual technical progress report contains research results on the feasibility of using copper indium disulfide for high-efficiency, thin-film Solar cells, done by Poly Solar Inc., for the Solar Energy Research Institute. Technical approaches consisted of: (1) preparation of the CuInS2 source material by direct synthesis; (2) deposition of CuInS2 films on conducting and insulating substrates by the close-spacing chemical vapor transport technique; (3) deposition of CuInS2 films by other chemical vapor deposition techniques; and (4) the formation and characterization of heterojunction solar cells. Deposition of p-type CuInS2 films on graphite, alumina, and coated graphite substrates by the CSCVT technique using iodine and hydrogen iodide as the transport agent was carried out under several conditions. Compositional, structural, and electrical properties of the films were characterized. Heterojunction solar cells were prepared from CuInS2/graphite using various window materials. CdS/CuInS2/graphite structures had an open-circuit voltage of 200 to 250 mV. The short-circuit current density and fill factor were low because of high series resistance. Preliminary work on the preparation of CuInS2 films by the sulfurization of Cu-In has also been done. This process shows considerable promise. DOE

N86-14751# Oak Ridge National Lab., Tenn.
MIXED CLATHRATES FOR COOL STORAGE APPLICATIONS
J. J. Carbajo Jul. 1985 30 p
(Contract DE-AC05-84OR-21400)
(DE85-015051; ORNL/TM-9530) Avail: NTIS HC A03/MF A01

Mixtures of refrigerants have been used to produce mixed-gas hydrates or clathrates at different pressures and temperatures. A clathrate at atmospheric pressure and at a temperature of 9.2 C (48.6 F) was obtained by using a mixture of Refrigerant-12 (R-12) and Refrigerant-11 (R-11). In addition, mixtures of R-12 and Refrigerant-114 (R-114) and of R-11 and R-114 have been tested. For these cases R-114 did not enter into the clathrate. Mixed hydrates or clathrates open new possibilities as the storage media for either cool or heat storage systems. DOE

N86-14752# Eltech Systems, Inc., Fairport Harbor, Ohio.
ALUMINUM/AIR BATTERY DEVELOPMENT Final Report

L. A. Knerr and D. J. Wheeler 15 Feb. 1985 196 p
(Contract W-7405-eng-48)
(DE85-016098; UCRL-15686) Avail: NTIS HC A09/MF A01

The following chapters are included: (1) aluminum anode research, (2) electrocatalysts research, (3) air cathode development, and (4) air cathode evaluation and characterization. DOE

N86-14753# Purdue Univ., West Lafayette, Ind. School of Mechanical Engineering.
PERFORMANCE ASSESSMENT OF OTEC POWER SYSTEMS AND THERMAL POWER PLANTS, VOLUME 1 Final Report
W. Leidenfrost, P. E. Liley, A. T. McDonald, I. Mudawwar, and J. T. Pearson May 1985 106 p
(Contract DE-AC03-76SF-00700)
(DE85-016501; DOE/SF-00700/T10-Vol-1) Avail: NTIS HC A06/MF A01

The focus of this report is on closed-cycle ocean thermal energy conversion (OTEC) power systems under research at Purdue University. The working operations of an OTEC power plant are briefly discussed. Methods of improving the performance of OTEC power systems are presented. Brief discussions on the methods of heat exchanger analysis and design are provided, as are the thermophysical properties of the working fluids and seawater. An interactive code capable of analyzing OTEC power system performance is included for use with an IBM personal computer. DOE

N86-14754# Harvard Univ., Cambridge, Mass. Dept. of Applied Science.
AMORPHOUS HYDROGENATED SILICON GERMANIUM ALLOYS SUITABLE FOR PHOTOELECTRONIC APPLICATIONS Annual Subcontract Report, 1 Jul. 1984 - 30 Jun. 1985
W. Paul Aug. 1985 38 p
(Contract DE-AC02-83CH-10093)
(DE85-016849; SERI/STR-211-2777) Avail: NTIS HC A03/MF A01

The principal objective of the first year of this research program has been to produce alloys of amorphous hydrogenated silicon germanium with a band gap near 1.5 eV that would have better photoelectronic properties than those of a-Si sub (1-x) Ge sub x:H produced to date, that they might be used as components of a tandem solar cell. To this end, a glow-discharge apparatus was modified to permit deposition of alloys from fluorine-containing gases. Different series of alloys were to be produced by adjustment of gas mixtures, substrate temperature, gas pressure, gas flow rates and RF power. The improvements in photoconductivity suggest that further research is desirable to establish the properties of both electrons and holes in device structures made from fluorine-containing gases and to discover the differences in atomic structure and band structure responsible for the different photoelectronic responses. DOE

N86-14755# Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Electrical, Computer, and Systems Engineering.
NEW IDEAS FOR PHOTOVOLTAIC CONVERSION Subcontract Annual Report
J. M. Borrego and S. K. Ghandhi Jul. 1985 72 p
(Contract DE-AC02-83CH-10093)
(DE85-016852; SERI/STR-211-2735) Avail: NTIS HC A04/MF A01

This report is a summary of the results obtained in the first year of a research program investigating the feasibility of using graded-band-gap solar cells under high illumination as an alternative to tandem cells. The graded-gap structure, studied both experimentally and theoretically, consisted of a p-Ga sub (1-x) Al sub x As graded region from x = 0.33 to x = 0, followed by a GaAs p-n junction. The results indicate that the lightly doped p-region enhances the open-circuit voltage of the cell but deteriorates the fill factor. Problems associated with the growth of the layers are also outlined in this report. DOE

N86-14756# Sandia National Labs., Albuquerque, N. Mex.
OXIDATION/SULFIDATION OF MATERIAL CANDIDATES FOR DISTRIBUTED SOLAR RECEIVER THERMOCHEMICAL TRANSPORT PROGRAM IN SO2/O2
L. J. Weirick Jun. 1985 35 p
(Contract DE-AC04-76DP-00789)
(DE85-017391; SAND-85-0757) Avail: NTIS HC A03/MF A01

Metals for potential use in the dissociator and the synthesizer reactors of a distributed solar receiver thermochemical transport loop utilizing SO3/SO2/O2 molecular chemistry were tested in SO2/O2 mixtures at 500 C and 900 C, respectively, for times of up to four weeks. They included titanium, aluminum and nickel, and iron-base, nickel-base and cobalt-base superalloys. Weight gain measurements determine the oxidation/sulfidation kinetics. Electron microprobe analysis identifies any possible penetration of oxygen and sulfur into the metal and the formation of internal oxides and sulfides. The most promising candidates as a result of these tests are the cobalt-base superalloys. DOE

N86-14757# Sandia National Labs., Albuquerque, N. Mex.
USE OF SOL-GEL THIN FILMS IN SOLAR ENERGY APPLICATIONS
R. B. Pettit and C. J. Brinker 18 Aug. 1985 37 p Presented at the SPIE International Technology Symposium on Optical and Electro-Optical Engineering, San Diego, Calif., 18 Jun. 1985
(Contract DE-AC04-76DP-00789)
(DE85-014838; SAND-85-0414C; CONF-850887-7) Avail: NTIS HC A03/MF A01

The sol-gel process uses metal alkoxides of network forming cations, such as Si, B, or Al, in alcohol/water solutions to form glass-like, polymeric networks in liquid solution. Thin films are formed by depositing the solution on a substrate by spinning, dipping or spraying. When the film is then heated to moderate temperatures (400 to 500 C), dense glass films or stable porous films are obtained. The use of sol-gel thin films in four solar energy materials applications is discussed. Encapsulation of black chrome solar selective coatings improved the high temperature thermal stability by a factor of 2.7. Formation of porous, antireflection coatings on glass envelopes used in solar thermal collectors increased the solar transmittance of the glass from 0.91 to greater than 0.96. Double-layer, antireflection coatings of SiO2 and TiO2 on silicon solar cells reduced the solar reflectance of the cells from 0.36 to 0.04 and thereby improved cell efficiencies by 50%. Protective coatings applied to silvered stainless steel substrates were used to form structural solar mirrors. Solar averaged specular reflectance values of 0.90 to 0.91 were obtained. DOE

N86-14758# Physical Sciences, Inc., Andover, Mass.
APPLICATION OF FUEL CELLS TO CHLORINE-CAUSTIC TECHNOLOGY
A. Gelb, A. Garman, and D. Bloomfield 1985 31 p refs Presented at conference
(DE85-014622; PSI-530/SR-217; CONF-850836-5) Avail: NTIS HC A03/MF A01

The results of a systems analysis investigation of the application of fuel cell technology to the chlorine caustic electrolytic industry are presented. A coupled electrolytic/alkaline fuel cell system designed to concentrate caustic and generate electricity shows large potential energy savings (30 to 50 percent reductions) and rapid return on investment. Author

N86-14759# Sandia National Labs., Albuquerque, N. Mex.
MAGMA ENERGY
H. C. Hardee 1985 4 p refs Presented at the 7th Miami International Conference on Alternative Energy Sources, Miami Beach, Fla., 9 Dec. 1985
(Contract DE-AC04-76DP-00789)
(DE85-017372; SAND-85-1914C; CONF-851201-1) Avail: NTIS HC A02/MF A01

The paper briefly describes the potential magma resources in the US and worldwide, and possible ways of exploiting this resource. Two target sites for field experiments to characterize magma targets are identified: Long Valley Caldera and Coso Hot Springs. DOE

N86-14760# Massachusetts Inst. of Tech., Cambridge. Lab. for Water Resources and Hydrodynamics.
ENTRAINMENT IN DIFFUSIVE THERMOHALINE SYSTEMS: APPLICATION TO SALT GRADIENT SOLAR PONDS
J. F. Atkinson, E. E. Adams, W. K. Melville, and D. R. F. Harleman Jul. 1985 327 p
(Contract DE-AC02-83CH-10093)
(DE85-012161; SERI/STR-252-2722) Avail: NTIS HC A05/MF A01

The development of a numerical model for simulating the temporal evolution of vertical temperature and salinity profiles in a salt-gradient solar pond is discussed. The model uses a mixed-layer approach, and a general entrainment relation is derived for predicting the growth of the upper mixed layer. One major effort involved studying the process of mixed-layer deepening in a strongly stratified diffusive double-diffusive system. In the first of two experiments, a vertically oscillating grid drove interfacial mixing in a two-layer system in which the temperature and salinity differences between the layers were varied. The second experiment addressed wind-induced mixing in a laboratory wind/wave tank. Tests involved several different mean wind speeds and considered two-layer systems with salt or diffusive double-diffusive stratification. No differences could be seen in the results for the two different kinds of stratification. Additional experiments in the wind/wave tank tested the effect of placing floating plastic pipes or netting on the water surface. Results showed that both pipes and netting can effectively reduce wind mixing. Experimental data and data from previous research define suggested values for the coefficients in the entrainment model, which is incorporated into the full numerical simulation model. DOE

N86-14761# Los Alamos National Lab., N. Mex.
BAYESIAN ANALYSIS OF HEAT PIPE LIFE TEST DATA FOR RELIABILITY DEMONSTRATION TESTING
R. J. Bartholomew and H. F. Martz 1985 14 p Presented at the 8th International Conference On Structural Mechanics in Reactor Technology Brussels, Belgium, 19 Aug. 1985
(Contract W-7405-eng-36)
(DE85-007706; LA-UR-85-495; CONF-850809-16) Avail: NTIS HC A02/MF A01

The demonstration testing duration requirements to establish a quantitative measure of assurance of expected lifetime for heat pipes were determined. The heat pipes are candidate devices for transporting heat generated in a nuclear reactor core to thermoelectric converters for use as a space-based electric power plant. A Bayesian analysis technique is employed, utilizing a limited Delphi survey, and a geometric mean accelerated test criterion involving heat pipe power (P) and temperature (T). Resulting calculations indicate considerable test savings can be achieved by employing the method, but development testing to determine heat pipe failure mechanisms should not be circumvented. DOE

N86-14762# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
SOLAR THERMAL ADVANCED RESEARCH AND DEVELOPMENT BIBLIOGRAPHY
May 1985 44 p
(Contract DE-AC02-83CH-10093)
(DE85-008790; SERI/SP-271-2644) Avail: NTIS HC A03/MF A01

A total of 496 citations of technical publications related to the federal Solar Thermal Technology Research Program at the Solar Energy Research Institute are given. Entries include research performed at SERI and at various universities and other organizations under SERI subcontract from 1977 through September 30, 1984. DOE

N86-14763# Argonne National Lab., Ill.
SODIUM-SULFUR CELLS WITH HIGH CONDUCTIVITY GLASS ELECTROLYTES
P. A. Nelson, I. Bloom, J. Bradley, and M. F. Roche 1985 17 p Presented at the 20th Intersociety Energy Conversion Engineering Conference, Miami Beach, Fla., 18 Aug. 1985 Prepared in cooperation with Cincinnati Univ.
(Contract W-31-109-eng-38)
(DE85-012371; CONF-850808-7) Avail: NTIS HC A02/MF A01

A study is under way to develop glasses in the soda-alumina-zirconia-silica system that have high conductivity for sodium ions. Sodium-conductivity and corrosion experiments indicate that the target resistivity of 100 ohm-cm at 300(0)C can be achieved for glasses having satisfactory corrosion resistance for use in sodium-sulfur cells. The low resistivity makes possible a unique approach to cell design. Cells of 150 A-hr capacity were designed having 6-mm dia electrolytes and are expected to achieve a specific energy of up to 270 W-hr/kg. Others having 1.5-mm dia electrolytes are expected to attain a specific power of up to 2 or 3 kW/kg. Excellent heat removal can be provided for high-specific-power cells by short metallic paths from the center of the cell to the cooled cell wall. Reliability of the cell may be achieved by: (1) use of a protective tube around each electrolyte tube to protect against failure propagation, and (2) the provision for automatic disconnection of a failed element by burnout of its current collector wire. DOE

N86-14764# California Univ., Berkeley. Lawrence Berkeley Lab.
TECHNOLOGY BASE RESEARCH PROJECT FOR ELECTROCHEMICAL ENERGY STORAGE Executive Summary Report, 1984
K. Kinoshita, ed. 1 May 1985 22 p
(Contract DE-AC03-76SF-00098)
(DE85-013910; LBL-19544) Avail: NTIS HC A02/MF A01

A major goal of this program is to develop electrochemical power sources suitable for application in electric vehicles and/or electric load-leveling devices. The program centers on advanced secondary batteries and fuel cells that offer the potential for high performance and low life-cycle costs. The DOE electrochemical energy storage program is divided into two projects: the exploratory technology development and testing (ETD) project and the technology ease research (TER) project. The specific goal of the TBR project is to identify the most promising electrochemical technologies and transfer them to industry and/or the ETD Project for further development and scale-up. The TBR project is divided into three major project elements: Exploratory research, applied science research, and air systems research. Highlights of each project element are summarized. DOE

N86-14765# Lahmeyer International, Frankfurt (West Germany).
DESCRIPTION OF REALISTIC REGIONS FOR THE INSTALLATION OF LARGE WIND POWER STATIONS IN WEST GERMANY Final Report, Sep. 1984
Hasso vanBierbrauer, Helmut Ernst, Helmut Klenk, Christoph Merkel, Klaus Peter, and Heino vonWinning Bonn Bundesministerium fuer Forschung und Technologie May 1985 649 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-85-053; ISSN-0340-7608) Avail: NTIS HC A99/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 81.60

West German regions are investigated for the installation of large wind power stations. Exploitable wind energy potential of the North Sea and Baltic Sea areas, Northern German coastal areas and uplands is assessed. The regions studied have an average annual wind velocity $>$ 4 m/sec at 10 m above ground and are listed according to their immediate economical exploitation in case of energy price increases. The suitable sites for the implantation of large wind power stations represent a 240 million GJ/a total wind energy potential. Author (ESA)

N86-14766# Technische Univ., Berlin (West Germany). Inst. fuer Luft- und Raumfahrt.
A LOGISTICS MODEL FOR LARGE SPACE POWER SYSTEMS
H. H. Koelle and Arno Jacobs 1985 48 p refs
(ILR-Mitt-149) Avail: NTIS HC A03/MF A01

A logistics model for spaceborne power plants which would send solar generated electricity to Earth from geostationary orbit was developed. If a space manufacturing facility, a maintenance

and repair facility for operational units, and a space logistics operation center are included in the GEO complex, 17 Mg mass per Mw power in the 1st year and 7.1 Mg/Mw in the 50th year is predicted. Personnel requirements in GEO are 245 (1st) and 600 in the 50th year. The average mass flow from the Moon to GEO is 55,000 Mg p.a.; from the Earth come 42,000 Mg p.a. These flows require 500 lunar bus launches and 540 heavy lift launches p.a. The use of lunar resources reduces the logistic cost to 67% compared to an all Earth resources scenario. The model assumes 111 units each producing 5 GW, with 90% availiability, i.e., 500 GW, for a 50 yr life cycle. Author (ESA)

N86-14767# Technische Hogeschool, Delft (Netherlands). Lab. voor Schakeltechniek en Techniek van der Informatieverwerkende Machines.

COMFORTABLY SAVING ENERGY [AANGENAAM ENERGIE BESPAREN]

H. J. Elich 25 Apr. 1984 114 p refs In DUTCH

(Rept-051560-28(1984)04) Avail: NTIS HC A06/MF A01

A central heating control system saving energy and improving comfort was digitally implemented. Based on control principles and simulation a control algorithm was determined. Two microcomputers are used to process room and boiler sensor data and are connected with each other by two-wire communication. The system provides a low and constant boiler temperature, an accurately controlled room temperature, a built-in pump switch, and the possibility to adjust the temperature four times a day.

Author (ESA)

N86-14768# Fondazione Ugo Bordoni, Rome (Italy).

A DIFFERENTIAL GEOMETRY CHARACTERIZATION OF RESTRICTED COHERENCY IN ELECTRIC POWER GENERATORS [UNA CARATTERIZZARIONE GEOMETRICO-DIFFERENZIALE DELLA STRETTA COERENZA NELLE RETI ELETTRICHE DI POTENZA]

Riccardo Marino (Rome Univ.) and Salvatore Nicosia (Rome Univ.) Dec. 1984 31 p refs In ITALIAN Sponsored by Ente Nazionale per l'Energia Elettrica

(FUB-25-1984) Avail: NTIS HC A03/MF A01

The theory of nonlinear systems is approached by differential geometry to obtain the necessary and sufficient conditions to give restricted coherency between two electric generators. The conditions coincide with those found when a linearized model is considered. An algorithm may be obtained using symbolic languages to identify automatically the group of generators in restricted coherency. Author (ESA)

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N86-14769# Argonne National Lab., Ill. Environmental Research Div.

ENVIRONMENTAL EFFECTS RESEARCH Annual Report, Jan. - Dec. 1983

P. F. Gustafson and J. E. Miller 11 Dec. 1985 86 p refs

(Contract W-31-109-eng-38)

(ANL-83-100-Pt-3) Avail: NTIS HC A05/MF A01

Argonne National Laboratory has been a participant in the National Crop Loss Assessment Network (NCLAN) since 1980. A major ojective of this program is to determine the dose-response relationships between ozone (O3) and the yield of important agricultural crops. The Terrestrial Ecology group continued its involvement in the National Crop Loss Assessment Network, and studies of O3 effects on winter wheat and soybeans were completed. Experiments on O3 x SO2 interactions on soybeans were also performed. The Microcosms for Acid Rain Studies (MARS) project had its first full year of research and much information concerning acid rain impacts on soil-plant systems was collected. A study of the influence of temporal variations in rain acidity on soybean productivity was also initiated. The acquatic radiochemistry group continued measurements of the mobility of plutonium and americium at a disposal site at Los Alamos. Laboratory tracer experiments were carried out to study the adsorptive behavior of neptunium, the solubility limits of plutonium, and the influence of rare earth concentration on the sorption and redox behavior of plutonium. Several studies were initiated on the influence of mycorrhizae to host plants in disturbed and natural environments. Future research will be directed at understanding how below-ground symbiotic associations may increase the fitness of host plants. B.W.

N86-14770*# Drexel Univ., Philadelphia, Pa. Dept. of Mechanical Engineering and Mechanics.

OXIDES OF NITROGEN EMISSIONS FROM THE COMBUSTION OF MONODISPERSE LIQUID FUEL SPRAYS Ph.D. Thesis

Hamid Sarv Jun. 1985 173 p refs

(Grant NAG3-1)

(NASA-CR-176373; NAS 1.26:176373) Avail: NTIS HC A08/MF A01 CSCL 13B

A study of NO sub x formation in a one dimensional monodisperse spray combustion system, which allowed independent droplet size variation, was conducted. Temperature, NO and NO sub x concentrations were measured in the transition region, encompassing a 26 to 74 micron droplet size range. Emission measurements of hydrocarbons, carbon monoxide, carbon dioxide and oxygen were also made. The equivalence ratio was varied between 0.8 and 1.2 for the fuels used, including methanol, isopropanaol, n-heptane and n-octane. Pyridine and pyrrole were added to n-heptane as nitrogen-containing additives in order to simulate synthetic fuels. Results obtained from the postflame regions using the pure fuels indicate an optimum droplet size in the range of 43 to 58 microns for minimizing NO sub x production. For the fuels examined, the maximum NO sub x reductions relative to the small droplet size limit were about 10 to 20% for lean and 20 to 30% for stoichiometric and rich mixtures. This behavior is attributed to droplet interactions and the transition from diffusive to premixed type of burning. Preflame vaporization controls the gas phase stoichiometry which has a significant effect on the volume of the hot gases surrounding a fuel droplet, where NO sub x is formed. R.J.F.

N86-14771# Army Construction Engineering Research Lab., Champaign, Ill.

COMMUNITY REACTION TO IMPULSIVE NOISE. A FINAL 10-YEAR RESEARCH SUMMARY: REVISED Final Report

P. D. Schomer and R. D. Neathammer Jun. 1985 106 p Supersedes report dated Feb. 1984, AD-A141 762

(DA Proj. 4A1-62720-A-896)

(AD-A159455; AD-E950749; CERL-TR-N-167-REV) Avail: NTIS HC A06/MF A01 CSCL 20/1

A major concern of Army planners is the trend toward siting off-installation housing and other noise-sensitive land uses in areas exposed to high noise levels produced by Army training or operational activities. To do effective noise-related assessments and planning the Army must be able to assess the community reaction to impulsive noise. Impulsive noise is produced by Army noise sources like armor, artillery, and demolition. This collection of papers summarizes 10 years of work by the U.S. Army Construction Engineering Research Laboratory (CERL) in the area of community response to impulsive noise. It is based on laboratory tests using a blast noise simulator, a study of Army-wide noise complaints, and attitudinal surveys conducted at Fort Bragg, NC, and Fort Lewis, WA. The attitudinal surveys provide most of the data. The major conclusions show that an energy type of model such as the C-weighted day/night average sound level (CDNL) is the best available descriptor for community response. Growth in annoyance to all noises increases monotonically with both sound amplitude and frequency of occurrence. This descriptor should incorporate a nighttime adjustment on the order of 10 decibels (dB). GRA

N86-14772# Ohio State Univ., Columbus. Dept. of Civil Engineering.

ENVIRONMENTAL IMPACT RESEARCH PROGRAM: SELECTION OF TURBULENCE AND MIXING PARAMETERIZATIONS FOR ESTUARY WATER QUALITY MODELS Final Report
K. W. Bedford Aug. 1985 163 p
(Contract DACW39-82-M-2365)
(AD-A159510; WES/MP/EL-85-2) Avail: NTIS HC A08/MF A01 CSCL 08/3

Recognizing the interdependence between turbulence closure models required for an estuary transport model and the physics to be resolved in the model, this report summarizes considerations in the selection of the turbulence model. A review of various types of estuaries and their origins is followed by a description of commonly accepted physical transport mechanisms in estuaries. Recent research on estuaries is summarized. Following a synthesis of estuary timespace variability, averaging methods for deriving estuary transport models consistent with this variability are generalized. The equations for one-dimensional, two-dimensional (vertical and horizontal), and three-dimensional models are presented with particular attention paid to the terms requiring closure. Turbulence models are reviewed in the context of a hierarchical approach with commonly used functional forms and coefficient values tabularized. Finally, selection guidelines for the various closure forms are summarized. Author (GRA)

N86-14773# Massachusetts Inst. of Tech., Lexington. Lincoln Lab.
LASER REMOTE SENSING OF ATMOSPHERIC POLLUTANTS Final Report, 1 Oct. 1983 - 30 Sep. 1984
D. K. Killinger, N. Menyuk, and A. Mooradian 30 Sep. 1984 65 p
(Contract F19628-85-C-0002)
(AD-A159531; ESD-TR-85-212; AFESC/ESL-TR-85-34) Avail: NTIS HC A04/MF A01 CSCL 13/2

The specific tasks carried out during FY84 for this research program consisted of the following: (1) continuation of the CO2 DIAL program with a remote sensing measurement of NH3 and an analysis of system accuracy limitations; (2) further improvements in the Co:MgF2 DIAL system measurement capability; (3) column-content remote sensing of HCl and initial range-resolved H2O concentration measurements with the Co: MgF2 DIAL system; and (4) initial investigation of frequency shifting the Co:MgF2 laser radiation. GRA

N86-14774# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Lab.
WETLANDS RESEARCH PROGRAM. WETLANDS FUNCTIONS AND VALUES STUDY PLAN Final Report
E. J. Clairain, Jr., D. R. Sanders, Sr., H. K. Smith, and C. V. Klimas Aug. 1985 80 p
(AD-A159630; WES/TR/Y-83-2) Avail: NTIS HC A05/MF A01 CSCL 08/6

This report presents a research protocol for wetlands functions and value studies. An assessment technique developed for the Federal Highway Administration (FHWA) will serve as the framework for these activities. The study plan describes a multiyear research effort that will lead to the refinement, regionalization, and computerization of the FHWA Technique. The study plan also identifies research to strengthen the FHWA Technique by improving the technical literature upon which the technique is based. The study plan balances Corps wetlands values assessment needs with weaknesses in the technical literature to produce a list of national research priorities. Priority research identified in the study plan includes hydrology, water quality, and fish and wildlife studies (primary and secondary productivity) in: Bottomland hardwoods, including swamps, of the Gulf and South Atlantic Coast and Interior: Midcentral Regions; Freshwater marshes adjacent to rivers and lakes in the Interior: North Central-Great Lakes Region; Estuarine marshes in the Pacific Coast Region; Swamps in the North Atlantic Region; and Tundra in the Alaska Region, Priority function-specific studies and some special studies are also identified. GRA

N86-14775# Lawrence Livermore National Lab., Calif.
USE OF FIELD EXPERIMENTAL STUDIES TO EVALUATE EMERGENCY RESPONSE MODELS
P. H. Gudiksen, R. Lange, D. J. Rodriguez, and J. S. Nasstrom 16 Jul. 1985 30 p refs Presented at the Workshop on Real-time Computing of the Environmental Consequences of An Accidental Release To Atmosphere From a Nuclear Installation, Luxembourg, 17 Sep. 1985 Prepared in cooperation with EG and G Energy Measurements, Inc., San Ramon, California
(Contract W-7405-eng-48)
(DE85-015545; UCRL-92342; CONF-8509130-1) Avail: NTIS HC A03/MF A01

The three-dimensional diagnostic wind field model (MATHEW) and the particle-in-cell atmospheric transport and diffusion model (ADPIC) are used by the Atmospheric Release Advisory Capability to estimate the environmental consequences of accidental releases of radioactivity into the atmosphere. These models have undergone extensive evaluations against field experiments conducted in a variety of environmental settings ranging from relatively flat to very complex terrain areas. Simulations of tracer experiments conducted in a complex mountain valley setting revealed that 35 to 50% of the comparisons between calculated and measured tracer concentrations were within a factor of 5. This may be compared with a factor of 2 for 50% of the comparisons for relatively flat terrain. This degradation of results in complex terrain is due to a variety of factors such as the limited representativeness of measurements in complex terrain, the limited spatial resolution afforded by the models, and the turbulence parameterization based on sigma/sub theta/ measurements to evaluate the eddy diffusivities. Measurements of sigma/sub theta/ in complex terrain exceed those measured over flat terrain by a factor of 2 to 3 leading to eddy diffusivities that are unrealistically high. The results of model evaluations are very sensitive to the quality and the representativeness of the meteorological data. This is particularly true for measurements near the source. The capability of the models to simulate the dispersion of an instantaneously produced cloud of particulates was illustrated to be generally within a factor of 2 over flat terrain. DOE

N86-14776# Oak Ridge National Lab., Tenn.
SIGNIFICANCE OF THE DISTRIBUTION OF BOMB-PRODUCED RADIOCARBON IN THE OCEAN
T. H. Peng 1985 19 p refs Presented at the 12th International Radiocarbon Conference, Trondheim, Norway, 24 Jun. 1985
(Contract DE-AC05-84OR-21400)
(DE85-016154; CONF-850637-1) Avail: NTIS HC A02/MF A01

The pattern of global water column inventories of bomb-produced radiocarbon suggests that a sizable portion of the bomb radiocarbon that entered the Antarctic, the northern Pacific, and the tropical oceans has been transported to the adjacent temperate regions. Models of lateral transport of surface water in the Atlantic, Indian, and Pacific Oceans are designed on the basis of this distribution pattern. Upwelling of bomb-radiocarbon-free water from below takes place in the Antarctic, the northern Pacific, and the tropical regions; and downwelling of surface water occurs in the temperate oceans and in the northern Atlantic. Uptake of excess CO2 by these models is calculated using the observed Mauna Loa pCO2 record as an input function. Results indicate that 35 percent of fossil fuel CO2 is taken up by these model oceans during the period 1958 to 1980. Considering the observed airborne fraction of 0.55, it appears that about 10 percent of the global fossil fuel CO2 is still missing. DOE

N86-14777# Oak Ridge National Lab., Tenn.
ESTIMATING THE AIR QUALITY IMPACTS OF FLARE OPERATIONS
D. B. Hunsaker, Jr. and F. C. Kornegay Jun. 1985 10 p Presented at the Air Pollution Control Association Annual Meeting and Exhibition, Detroit, Michigan, 16 Jun. 1985
(Contract DE-AC05-84OR-21400)
(DE85-016418; Paper-85-64.7; CONF-850612-7) Avail: NTIS HC A02/MF A01

The body of information presented in this paper is directed to

air quality planners and engineers who are interested in predicting the air quality impacts of proposed facilities using flares for pollution control devices. Available plume rise algorithms are used to compare predicted plume rise values for typical large and small commercial flares for a range of momentum effects and atmospheric stability conditions. It is found that buoyant flare plumes have the greatest potential for impact under unstable atmospheric conditions, in which the vertical motion of the atmosphere brings the flare emissions to ground level before appreciable dispersion has occurred. Plume rise and associated ground-level concentrations from momentum-dominated flare plumes were found to be unaffected by stability conditions; the predicted pollutant concentrations (10(-5) g/m(3)), and distances of the concentration from release point (less than 0.5 km), agreed with those for buoyant plumes under unstable conditions. In these cases, flare emissions could produce high ground-level pollutant concentrations, depending on the emission rate. It is recommended that a flare plume rise field research program be initiated to better quantify flare plume rise and associated ground-level pollutant concentrations under various atmospheric conditions. DOE

N86-14778# Los Alamos National Lab., N. Mex.
NUMERICAL SIMULATIONS OF VALLEY VENTILATION AND POLLUTANT TRANSPORT
T. Yamada 1985 9 p refs Presented at the 7th Symposium on Turbulence and Diffusion of the AMS, Boulder, Colo., 12 Nov. 1985
(Contract W-7405-eng-36)
(DE85-017555; LA-UR-85-2887; CONF-851177-2) Avail: NTIS HC A02/MF A01

As a part of the siting methodology task for the DOE oil shale project the Los Alamos National Laboratory three-dimensional atmospheric models were used to assess potential environmental problems associated with future development of oil shale energy in Colorado. An area of 200 km x 200 km centered at Brush Creek, Colorado, where the ASCOT conducted extensive meteorological and tracer experiments in September/October 1984, was chosen as an initial simulation area. In this paper, preliminary simulations of the mean wind, turbulence, and nonreactive tracer transport are presented, where very little input data were available. Since data to compare with are not available, we discuss only qualitatively the model capability to produce: (1) complex airflow generated by differential heating and cooling over sloped surfaces; (2) strong diurnal variations in wind speed, wind direction, and atmospheric turbulence; and (3) enhanced daytime ventilation in a valley. The hydrodynamic model used to compute wind and turbulence is reviewed in Section 2 where a brief description of boundary and initial conditions, and numerical procedures are also included. Examples of the computed wind and turbulence distribution are given in Section 3. A random-particle statistical diffusion model is used to simulate tracer transport and diffusion where the computed wind and turbulence fields are utilized to determine tracer locations. DOE

N86-14779# Harvard Univ., Cambridge, Mass.
EFFECT OF ELEVATED ATMOSPHERIC CO2 ON PLANT COMMUNITIES
F. A. Bazzaz, K. Garbutt, and W. E. Williams Jul. 1985 43 p refs
(Contract DE-AC02-77EV-04329)
(DE85-015814; DOE/EV-04329/5) Avail: NTIS HC A03/MF A01

Research results are summarized in the following areas: (1) effects of elevated SO2 and CO2 on soybean; (2) effects of elevated SO2 and CO2 on C3 and C4 annuals; (3) effect of elevated CO2 on growth, photosynthesis, transportation and water-use efficiency; (4) effect of elevated CO2 on annuals grown in competition on a soil moisture gradient; (5) effect of elevated CO2 on growth of six annuals grown in competition on nutrient and light gradients; (6) competition between soybean and abutilon (C3) and soybean and amaranthus (C4); (7) effect of CO2 on competition in short grassland from California; (8) effect of CO2 on competition in upland and bottomland deciduous trees; (9) relationship between CO2 and flowering, fruiting, and seed production in abutilon and datura; (10) relationship between CO2 and flowering phenology in Phlox populations; and (11) competition between amaranthus and abutilon: photosynthesis and growth analyses. DOE

N86-14780# Brookhaven National Lab., Upton, N. Y.
TRACE GAS DETECTION BY INTRA-CAVITY LASER PHOTOTHERMAL DEFLECTION
K. H. Fung and H. B. Lin Apr. 1985 5 p Presented at the 4th International Topical Meeting On Photoacoustic, Thermal and Related Science, Quebec, 4 Aug. 1985
(Contract DE-AC02-76CH-00016)
(DE85-012182; BNL-36445; CONF-850886-1) Avail: NTIS HC A02/MF A01

An improved thermal lens detector in which the output of the probe laser is modulated by the photothermal process taking place within its cavity is presented. DOE

N86-14781# Argonne National Lab., Ill.
INTEGRATED ASSESSMENTS AND POLICY EVALUATION GROUP AND CENTER FOR INTERNATIONAL ENERGY DEVELOPMENT. Program Summary
Apr. 1985 97 p
(Contract W-31-109-eng-38)
(DE85-014368; ANL/EES-TM-280) Avail: NTIS HC A05/MF A01

Programmatic accomplishments since 1981 in two staff groups of the Energy and Environmental Systems Division: the Integrated Assessments and Policy Evaluation (IAPE) group and the Center for International Energy Development (CIED) are summarized. This summary provides background information on major accomplishments. An overview of staffing and programs, and a list of recent publications are given. DOE

N86-14782# Tennessee Valley Authority, Knoxville. Office of Natural Resources and Economic Development.
INSTREAM CONTAMINANT STUDY. TASK 1: WATER SAMPLING AND ANALYSIS
Apr. 1985 164 p
(Contract DE-AI05-84OR-21444)
(DE85-013501; DOE/OR-21444/T1) Avail: NTIS HC A08/MF A01

The hydrologic characteristics and mercury concentrations in East Fork Poplar Creek and Bear Creek for sediment transport predictions are discussed. A limited number of water quality samples were collected to determine the presence of other contaminants which might be added to ongoing monitoring programs. Flow measurements or water samples were collected from the Clinch River, East Fork Polar Creek Bear Creek, Poplar Creek, and lower White Oak Creek during one baseflow condition and from East Fork Poplar Creek, Bear Creek, and Mill Branch during two Stormflow conditions. Baseflow field measurements included dissolved oxygen (DO), temperature, pH, conductivity, alkalinity, and water level. Laboratory analyses included selected metals, nutrients, priority pollutants, oil and grease, solids, turbidity, hardness, and radiological parameters. The stormflow surveys involved sampling and laboratory analyses of mercury, suspended solids, turbidity, particle size distribution, specific gravity, and radiological parameters. Streamflow and precipitation data were also collected during each stormflow survey. DOE

N86-14783# Purdue Univ., West Lafayette, Ind. Water Resources Research Center.
SINGLE-WELL, MULTIPLE-PULSE TRACER TECHNIQUE FOR ESTIMATING GROUND WATER VELOCITIES AND POLLUTANT TRANSPORT RATES: THEORETICAL DEVELOPMENT Technical Report, 1 Oct. 1983 - 31 Aug. 1984
P. G. Kaplan and D. I. Leap Aug. 1984 32 p
(Grant DI-14-08-0001-G-841)
(PB85-225845; TR-167; USGS/G-841-02) Avail: NTIS HC A03/MF A01 CSCL 08H

Two new methods were developed to provide ground water velocity estimations. The new methods determine velocity over a larger distance from the well than is possible with the standard

methods, and the tracer pulses utilized in the new methods are narrow enough that their behavior approaches that of a point in a flow field. Both methods utilize the superposition of radial, well-flow velocity and lienar, regional groundwater velocity. Neither of the theories was tested experimentally or in a field setting. Plans exist for laboratory testing of both using scale models of aquifers. The first method requires prior knowledge of the product of effective porosity and aquifer thickness. Three pulses are allowed to drift into the aquifer and are then pumped back. Variations in retrieved pulse spacing are used to estimate drift distance and regional velocity. GRA

N86-14784# Environmental Protection Agency, Research Triangle Park, N.C. Environmental Monitoring Systems Lab.
USEPA (US ENVIRONMENTAL PROTECTION AGENCY) PM(SUB 10) METHODOLOGY REVIEW Final Report
L. J. Purdue 1985 19 p refs
(PB85-219731; EPA-600/D-85-129) Avail: NTIS HC A02/MF A01 CSCL 14B

The proposed FRM for PM(sub 10) is based on discrimination and selection of PM(sub 10) particles by inertial separation in a specially shaped inlet, followed by conventional filtration of a measured volume of sampled air and determination of the net weight gain of the filter. Wherever feasible, sampler requirements are prescribed by functional or performance specifications to allow maximum flexibility in the design or configuration of PM(sub 10) samplers. Candidate samplers would have to be tested according to explicit test procedures and formally designated as reference or equivalent methods. The proposed NAAQ's and related monitoring requirements are reviewed and EPA's PM(sub 10) sampler development and evaluation activities are discussed. GRA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation.*

N86-14785 Texas Christian Univ., Fort Worth.
BIOSTRATIGRAPHY AND MARINE PALEOENVIRONMENTS OF THE GULF OF MEXICO, THE WESTERN CARIBBEAN, AND THE EASTERN EQUATORIAL PACIFIC Ph.D. Thesis
Jinder Chow 1985 309 p
Avail: Univ. Microfilms Order No. DA8514244

A comparative biostratigraphic and paleoenvironmental analysis was made of the nannofossils in late Neogene sediments from the Gulf of Mexico, the western Caribbean, and the eastern Equatorial Pacific. Species diversity indices and the coccolith assemblages indicate stable surface waters with little physical stress in the Gulf of Mexico from the late Miocene to the very early Pliocene. Thereafter instability and physical stress in surface waters increased dramatically. The diversity record in the western Caribbean is similar but stronger fluctuations of the indices indicate greater instability and physical stress there than in the Gulf of Mexico during the late Miocene, probably caused by interaction of water masses across the central American passage. Cluster analysis shows that vertical distribution of cluster groups in the Gulf of Mexico and the western Caribbean is related to age. The cluster groups indicate that the coccolith assemblages differentiated in the western Caribbean and in the eastern Pacific after the mid-Pliocene. Dissert. Abstr.

N86-14786 California Univ., Berkeley.
PALEOMAGNETISM AND TECTONIC STUDIES OF THE SCAGLIA ROSSA PELAGIC LIMESTONES (UPPER CRETACEOUS-EOCENE) FROM THE UMBRIA-MARCHES APENNINES, ITALY Ph.D. Thesis
Lung Sang Chan 1984 293 p
Avail: Univ. Microfilms Order No. DA8512774

The magnetic stratigraphy of the Scaglia Rossa pelagic limestones (Upper Cretaceous-Eocene) was determined at eight sites in the Umbria and Marches Regions of the Northern Apennines, Italy. Alternating field-and-thermal demagnetization, as well as isothermal remanent magnetization analysis, were carried out on samples collected at 1 m intervals. Microfossils in the specimens were studied to facilitate identification of the magnetic polarity intervals. The paleomagnetic results show that the Scaglia Rossa carries multiple magnetic components residing in magnetite and authigenic hematite. Refined magnetic and stratigraphic measurements in the studied sections reveal a negative correlation between the magnetic intensity at 550 C and the sedimentation rate. The absolute rate of formation of authigenic hematites in the Scaglia Rossa is estimated to be about 1 A per thousand years. The present study helps to reconstruct the evolution of the Umbria-Marches Basin. Dissert. Abstr.

N86-14787 Oregon Univ., Eugene.
THE RELATIONSHIP BETWEEN BASIN EVOLUTION AND GENESIS OF STRATIFORM SULFIDE HORIZONS IN MID-PROTEROZOIC SEDIMENTS OF CENTRAL MONTANA (BELT SUPERGROUP) Ph.D. Thesis
Juergen Schieber 1985 834 p
Avail: Univ. Microfilms Order No. DA8514812

Extensive horizons of pyritic shales were deposited along the margins of the Helena embayment, an eastern extension of the Proterozoic Belt basin. Transgression of an orthoauartzite blanket in the area of the Helena embayment. Subsequently a gentle depression formed and shale and carbonate deposition was prevalent. Some time later a half-graben formed with a basin bounding fault zone in the south, and a regression occurred. Rare earth element patterns and bulk chemical composition of the sediments suggest dominance of chemical weathering in the source area, and a granitic crust. The sulfide horizons formed in the very early stages of the transgression after deposition of the arkosic sandstones. Basin marginal drainages were of sufficient size to have provided all the iron that is found in the basin marginal pyritic shale horizons. Base metal mineralization in the same sedimentary sequence is diagenetic, porosity controlled, of low grade, and may have formed some million years after the pyrite. The sequence of diagnetic minerals is pyrite, quartz, sphalerite, galena, and dolomite. Base metal mineralization is unrelated to iron mineralization, and their partial superimposition is probably coincidental. Dissert Abstr.

N86-14788 Colorado State Univ., Fort Collins.
INFERENCE OF PHOTOCHEMICAL TRACE GAS VARIATIONS FROM DIRECT MEASUREMENTS OF OZONE IN THE MIDDLE ATMOSPHERE Ph.D. Thesis
Arlin James Krueger 1984 284 p
Avail: Univ. Microfilms Order No. DA8518431

The chemical processes that control the distribution of stratospheric ozone are reasonably well understood but the sources of stratospheric odd nitrogen, a major factor in the chemistry of ozone, are disputed. In this study, the observed variations of ozone are analyzed with a photochemical model to assess the variability of trace photochemical constituents and to diagnose the sources of NOx. The atmospheric data base consists of direct measurements of ozone density and air temperature with sounding rockets. The components of mid-latitude ozone variability are derived from regular monthly launches of ROCOZ optical ozone sondes on Super Loki rockets at Wallops Island. The annual cycle dominates all other sources of variation between 20 and 0.5 mb except for a phase transition region near 4 mb. The ozone measurement precision is inferred to be 3% by analysis of the unexplained variance at 10 mb. The annual average ozone distribution is compared with prior standard ozone models. Dissert. Abstr.

N86-14789*# San Diego State Univ., Calif. Dept. of Electrical and Computer Engineering.
MEASUREMENTS OF HO2 CHEMICAL KINETICS WITH A NEW DETECTION METHOD Annual Technical Report, 1 Dec. 1984 - 30 Nov. 1985
Long C. Lee and E. R. Manzanares 12 Dec. 1985 39 p refs

(Grant NAGw-661)
(NASA-CR-176417; NAS 1.26:176417) Avail: NTIS HC A03/MF A01 CSCL 04A

In this research program, HO2 was detected by the OH(A-X) photofragment from dissociative excitation of HO2 at 147 nm. This detection method was applied to measure the reaction rate constant of HO2 + O3. This reaction rate constant is needed for the understanding of stratospheric chemistry. Since C12 was used in the flow system, photoexcitation of C12 may produce fluorescence to interfere with the measurements. Thus, the photoexcitation process of C12 in the vacuum ultraviolet region was also examined in this research period using synchrotron radiation as a light source. The research results are summarized. B.W.

N86-14790# Colorado State Univ., Fort Collins.
EXPERIMENTAL STUDIES OF THE FLUVIAL SYSTEM Final Report, 1 Jul. 1983 - 30 Jun. 1985
S. A. Schumm 1 Jul. 1985 18 p
(Contract MIPR-ARO-111-83)
(AD-A158347; ARO-19702.8-GS) Avail: NTIS HC A02/MF A01 CSCL 08/6

The purpose of this project was to review the results of experimental investigations of landform development, landform evolution, and controls on landform morphology and dynamics. The emphasis was placed upon experiments carried out during 17 years at Colorado State University. A major goal was to make all of the significant results available in a monograph on experimental geomorphology. Three main groups of experiments were considered as follows: (1) drainage basin morphology and dynamics, (2) channel morphology and dynamics, (3) alluvial fan morphology, dynamics and sedimentology. A monograph has been prepared that reviews, integrated and evaluates these experimental results, and it will be published by Wiley and Sons in 1986. GRA

N86-14791# Boston Univ., Mass. Dept. of Astronomy.
THE DYNAMICS OF EQUATORIAL F LAYER IRREGULARITIES Final Report, 1 Mar. 1982 - 30 Jun. 1985
J. Aarons and M. Mendillo 30 Jun. 1985 33 p
(Contract N00014-82-K-0235)
(AD-A158650; ACBU-6276-5) Avail: NTIS HC A03/MF A01 CSCL 04/1

Among the topics discussed in the report are the following: Introduction to Equational Irregularities; Research Studies: (1) Ascension Island Observations and Analysis; (2) Empirical Model to Forecast Scintillation at 250 MHz along Magnetic Equator; (3) Magnetic Bay Triggering of Irregularity Patches; (4) Patch Walls; (5) Natal, Brazil, Observations and Analysis; (6) Simulation/Verification; Conclusions; Future Studies; Publication Summary. GRA

N86-14792# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
SYSTEMATICS OF THE AURORAL BOUNDARY AS INDICATED BY PARTICLE PRECIPITATION M.S. Thesis
C. D. Phillips Dec. 1984 73 p
(AD-A159216; AFIT/GSO/ENP-ENS/84D-4) Avail: NTIS HC A04/MF A01 CSCL 04/1

This thesis examined several ways of grouping data acquired by the DMSP/F7 satellite's electron and ion spectrometers, and used that data to decide the relationship between the latitude of the equatorward boundary of the electron and ion diffuse aurora. The statistical analysis was done with the SPSS computer package and data from the Special Sensor J/4 on board the Defense Meteorological Satellite Program F7 (Block 5D) spacecraft. The analytic technique used was bivariate linear regression, with the General Linear Test for the equality of two regression lines being used to compare different regression lines. The analysis of precipitating electrons and ions above the polar regions at about 840 kilometers found that the precipitation at different measured boundaries according to their magnetic local times of occurrence. Three hour wide bins were attempted, and were found to be less desirable than one hour wide bins. It was found that measured boundaries from the two poles can be combined in a single regression line. GRA

N86-14793# Sandia National Labs., Albuquerque, N. Mex.
NEAR-EARTH NATURAL AND WEAPON-GENERATED RADIATION ENVIRONMENTS
J. S. Browning and M. R. Ackermann Jul. 1985 35 p refs
(Contract DE-AC04-76DP-00789)
(DE85-015533; SAND-85-0499) Avail: NTIS HC A03/MF A01

This report summarizes the quantitative aspects of the near-earth natural and nuclear weapon-enhanced radiation environments. Methods for quantifying these environments are provided. Total-dose calculations are given to illustrate the relative severity of the radiation environments as a function of shielding. Techniques for calculating the total dose in the interior of a satellite are described. The RAD-PAK concept for including radiation shielding as an integral part of an integrated circuit package is introduced. DOE

N86-14794# Oak Ridge National Lab., Tenn.
GUIDELINES FOR EARTHQUAKE GROUND MOTION DEFINITION FOR THE EASTERN UNITED STATES
R. C. Gwaltney, G. A. Aramayo, and R. T. Williams 1985 11 p refs Presented at DOE National Phenomena Harzards Mitigation Conference, Las Vegas, Nevada, 7 Oct. 1985 Prepared in cooperation with South Carolina Univ., Columbia
(Contract DE-AC05-84OR-21400)
(DE85-016959; CONF-8510118-2) Avail: NTIS HC A02/MF A01

Guidelines for the determination of earthquake ground-motion definition for the eastern United States are established in this paper. Both far-field and near-field guidelines are given. The guidelines were based on an extensive review of the current procedures for specifying ground motion in the United States. Both empirical and theoretical procedures were used in establishing the guidelines because of the low seismicity in the eastern United States. Only a few large to great (M>/.5) sized earthquakes have occurred in this region, no evidence of tectonic surface ruptures related to historic or Holocene earthquakes have been found, and no currently active plate boundaries of any kind are known in this region. Very little instrumented data has been gathered in the East. Theoretical procedures are proposed so that in regions of almost no data a reasonable level of seismic ground motion activity can be assumed. The guidelines are to be used to develop the Safe Shutdown Earthquake, SSE. A new procedure for establishing the Operating Basis Earthquake, OBE, is proposed, in particular for the eastern United States. The OBE would be developed using a probabilistic assessment of the geological conditions and the recurrence of seismic events at a site. These guidelines should be useful in development of seismic design requirements for future reactors. DOE

N86-14795# Geological Survey, Denver, Colo.
TURONIAN (EAGLEFORDIAN) STRATIGRAPHY OF THE ATLANTIC COASTAL PLAIN AND TEXAS
Page C. Valentine 1984 24 p refs
(TI85-902206; USGS-PP-1315) Avail: NTIS HC A02/MF A01

A stratigraphic analysis of 14 localities from new England to Georgia and of 1 well from the type area of the Eaglefordian Stage at Dallas, Tex., has resulted in a reevaluation of the ages of both formal and informal stratigraphic units previously established for the Atlantic and eastern Gulf Coastal Plains. Lower Turonian strata, once thought to be absent beneath the Atlantic Coastal Plain, are present. The study focused on a stratigraphic interval that is characterized by the presence of distinctive calcareous nannofossil and pollen floras. The Complesiopollis-atlantopollis pollen assemblage zone, widespread throughout the Atlantic and Gulf Coastal Plains and previously dated as late Cenomanian, is now shown to be late Cenomanian-early Touronian on the Gulf Coast on the basis of its occurrence with calcareous nonfossils, planktic foraminifers, and mollusks of that age. DOE

N86-14796# Rome Univ. (Italy). Dipt. di Fisica.
GRAVITATIONAL RESEARCH. GRAVITATIONAL WAVES

[RICERCHE SULLA GRAVITAZIONE. LE ONDE GRAVITAZIONALI]
E. Amaldi and G. Pizzella 16 Apr. 1985 68 p refs In ITALIAN (Nota-Interna-846) Avail: NTIS HC A04/MF A01

Gravitational wave research is reviewed. Gravitational theory, relativity theory, experiments in general relativity, sources of gravitational waves, the Rome gravitational experiment, quantic limits of gravitational waves measurements and how to avoid those limits are discussed. Author (ESA)

N86-14797# Systems Applications, Inc., San Rafael, Calif.
SAI (SYSTEMS APPLICATIONS, INCORPORATED) AIRSHED MODEL OPERATIONS MANUALS. VOLUME 1: USER'S MANUAL Report, Aug. 1976 - Sep. 1979
J. Ames, T. C. Myers, L. E. Reid, D. C. Whitney, and S. H. Golding Apr. 1985 482 p
(Contract EPA-68-02-2429)
(PB85-191567; EM78-79R2-Vol-1; EPA-600/8-85-007A) Avail: NTIS HC A21/MF A01 CSCL 04A

A general view of the Airshed Model as well as detailed operating instructions for the user is presented. Included are discussions of all the files needed to run the model, the data preparation programs that produce each file, the input formats and data preparation methods, samples of input and output, and information flow diagrams that illustrate the job stream control on any computer. Chapter 2 presents a technical summary of the SAI Airshed Model and Chapter 3 contains an overview of the model as a system of computer programs, outlining the five main functions that must be performed by users and programs together. Chapter 4 discusses some of the concepts and terms basic to an understanding of the system, followed in Chapter 5 by descriptions of the job control notations that will be used throughout this manual. Chapters 6 through 11 examine in detail the five main functions of the system, providing input and output definitions and examples, and job control diagrams for each program that must be exercised. Author

N86-14798# Alaska Univ., Fairbanks. Inst. of Water Resources.
GEOCHEMISTRY OF SALINE LAKES OF THE NORTHEASTERN YUKON FLATS, EAST CENTRAL ALASKA
D. B. Hawkins Jan. 1985 32 p
(Contract DI-14-08-0001-G-827)
(PB85-214708; COMPLETION-184-16; USGS/G-827-04) Avail: NTIS HC A03/MF A01 CSCL 08D

Above the Arctic Circle in the Yukon Flats of northeastern Alaska, shallow, brackish water ponds are rimmed with evaporite minerals such as trona (NaHCO3Na2CO3). These ponds form in an area of Alaska characterized by an extreme continental climate with about six inches of precipitation annually. Evaporite formation occurs because evaporation exceeds inflow. The hydrogeochemistry of the waters of the Yukon Flats was investigated to determine the origin of the ponds and evaporite minerals. Evaporation of the freshwater lakes will first precpitate calcite and ultimately form trona. The change in relative concentrations of Ca(+2), HCO3, and SO4 in going from river water to lake water is critical and indicates that sulfate reduction accompanied by bicarbonate formation is an essential process that produces an excess of HCO3 over CA(+2). GRA

N86-14799# Illinois State Geological Survey, Urbana.
ILLINOIAN AND WISCONSINAN STRATIGRAPHY AND ENVIRONMENTS IN NORTHERN ILLINOIS: THE ALTONIAN REVISED
R. C. Berg, J. P. Kempton, L. R. Follmer, D. P. McKenna, and R. J. Krumm 1985 182 p
(PB85-212975; IL/SGS/GB-19) Avail: NTIS HC A09/MF A01 CSCL 08G

20 years of stratigraphic information generated through studies of the glacial deposits of northern Illinois are reviewed and a revised stratigraphic classification for deposits older than the Woodfordian (Wisconsinan) draft is presented. The recent findings of Berg, Kempton, and Stecyk (1984) are supplemented. The stratigraphic nomenclature is explained in more detail. A formal statement of the changes that have been made since the work of William and Frye (1970) are presented. While there are still many unresolved problems in unit definitions and correlations, the nomenclature presented should be continually revised and explained to be useful in future reports. GRA

N86-14904# Army Foreign Science and Technology Center, Charlottesville, Va.
VALIDATION OF A MULTILAYERED VISCOELASTIC SEISMIC PROPAGATION MODEL FOR SHORT TO MEDIUM RANGES
B. L. Carnes *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 13-35 (For primary document see N86-14902 05-59)
(AD-P004903) Avail: NTIS HC A99/MF E03 CSCL 12/1

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N86-14800 Colorado State Univ., Fort Collins.
PRECIPITATING CONVECTIVE CLOUD DOWNDRAFT STRUCTURE: A SYNTHESIS OF OBSERVATIONS AND MODELING Ph.D. Thesis
Kevin Robert Knupp 1985 312 p
Avail: Univ. Microfilms Order No. DA8517293

This study represents a comprehensive investigation in which observations are integrated with three-dimensional cloud model results to examine the kinematic, dynamic and thermodynamic structure of downdrafts associated with precipitating convection. One particular downdraft type, the low-level precipitation-associated downdraft, is investigated in considerable detail. General airflow and trajectory patterns within low-level downdrafts are typically convergent from approx. 0.8 km upwards to downdraft top, typically less than 5 km AGL. Observed mass flux profiles often increases rapidly with decreasing height as a result of strong buoyancy forcing below the melting level. Such patterns indicate that strong cooling by melting and evaporation within statically unstable low levels generates low perturbation pressure by virtue of buoyantly-induced pressure perturbations. Cloud model results verify this process and indicate that pressure perturbations are strongest during downdraft developing stages. Dissert. Abstr.

N86-14801 Utah Univ., Salt Lake City.
ON THE TRANSIENT KINETIC ENERGY OF THE TROPICS Ph.D. Thesis
Gregory Clark Dodd 1985 218 p
Avail: Univ. Microfilms Order No. DA8517651

The transient kinetic energy budgets are compiled using flow consistent geopotential heights (as computed from the full divergence equation) for Phase 2 and Phase 3, combined, of the Global Atmospheric Research Program (GARP) Atlantic Tropical Experiment (GATE) and for the Amazon Basin during the First Special Observing Period (SOP-1) for the First GARP Global Experiment (FGGE). The latter computations employ the level 3-b European Center for Medium Range Forecasting (ECMWF) analysis. It is found that the transient available potential energy is converted to transient kinetic energy in both regions. The GATE area acts as a source of transient kinetic energy, with contributions from both the horizontal pressure work and the horizontal flux of transient kinetic energy. While there is a horizontal flux of transient kinetic energy out of the Amazon Basin, work is done on this area at a greater rate. Consequently, the Amazon Basin acts as a sink of transient kinetic energy in its interactions with the surrounding areas. Dissert. Abstr.

N86-14802 Rice Univ., Houston, Tex.
SYNTHESIS OF ATMOSPHERIC ELECTRICITY OBSERVATIONS: A THUNDERSTORM ON JULY 23, 1977 IN FLORIDA; DAY 77203 TRIP 77, KENNEDY SPACE CENTER Ph.D. Thesis
Arvin Clarence Conrad, Jr. 1985 162 p
Avail: Univ. Microfilms Order No. DA8517189

Observations of an air-mass thunderstorm occurring July 22, 1977, during the Thunderstorm Research International Program (TRIP-77) at Kennedy Space Center (KSC), Florida are interpreted. These observations yield insight into storm dynamical and electrical mechanisms and their interrelationships. The dynamics of this storm are markedly different from that of the classical picture of an isolated convective system. The observed airmass cells exhibit dynamic and electric changes on time and spatial scales that are significantly smaller than described in text book examples: time scales on the order of 10 rather than 30 to 90 minutes and areal extents on the oder of < 4 km rather than 6 to 10 km. Fast canning radar (NMIM-RED/ALL) images indicate that dynamic periodicity is produced by rapid buoyant-bubble growth.

Dissert. Abstr.

N86-14803 Rice Univ., Houston, Tex.
IN SITU MEASUREMENTS OF THE CHARGE STRUCTURE OF TWO SEVERE STORMS IN OKLAHOMA Ph.D. Thesis
Gregory John Byrne 1985 115 p
Avail: Univ. Microfilms Order No. DA8517181

Electric field measurements inside two severe thunderstorms in Oklahoma were acquired with instrumented free balloons in order to investigate the properties of the storm electrical charge regions. These measurements are analyzed in conjunction with the balloon meteorological measurements and standard weather and Doppler radar data sets to relate the charge regions with the storm environmental features. The first known electric field measurements to be made within the core of a severe storm are presented. The storm exhibited a bipolar charge structure with diffuse net positive charge in the upper portion of the cloud and concentrated negative charge in the lower cloud. Electric fields in the anvil region of a severe storm were easured in two widely separated locations. The similar features of both measurements indicate that large amounts of layered charges extended horizonally for several tens of kilometers within the severe storm anvil.

Dissert. Abstr.

N86-14804*# Simpson Weather Associates, Inc., Charlottesville, Va.
INFLUENCE OF COHERENT MESOSCALE STRUCTURES ON SATELLITE-BASED DOPPLER LIDAR WIND MEASUREMENTS Monthly Progress Report
G. D. Emmitt and S. Houston Nov. 1985 23 p
(Contract NAS8-35597)
(NASA-CR-176421; NAS 1.26:176421) Avail: NTIS HC A02/MF A01 CSCL 04B

Efforts to develop display routines for overlaying gridded and nongridded data sets are discussed. The primary objective is to have the capability to review global patterns of winds and lidar samples; to zoom in on particular wind features or global areas; and to display contours of wind components and derived fields (e.g., divergence, vorticity, deformation, etc.). Current considerations in support of a polar orbiting shuttle lidar mission are discussed. Ground truth for a shuttle lidar experiment may be limited to fortuitous alignment of lidar wind profiles and scheduled rawinsonde profiles. Any improvement on this would require special rawinsonde launches and/or optimization of the shuttle orbit with global wind measurement networks. B.W.

N86-14805# National Oceanic and Atmospheric Administration, Norman, Okla. National Severe Storms Lab.
AUTOMATIC DETECTION OF GUST FRONTS Final Report
H. Uyeda and D. S. Zrnic Apr. 1985 66 p Original contains color illustrations
(Contract DEFA01-80-Y-10524)
(AD-A156723; DOT/FAA/PM-85/11) Avail: NTIS HC A04/MF A01 CSCL 04/2

Early displays of Doppler spectral moments demonstrated that many hazardous weather features produce characteristic signatures that human observers can readily interpret. Although recognition of these signatures by trained human observers is not complicated, there are strong reasons to develop automated techniques that would help or in some cases even replace the human operator. A procedure was developed that detects and tracks gust fronts automatically. It does not rely on a single method but requires simultaneous operation of two related algorithms. The convergence algorithm measures radial convergence and hence only gusts propagating along radials can be readily detected. The mesocyclone-shear algorithm measures azimuthal shear and is suitable for detecting gusts parallel with radials as well as low level vortices. Long shear lines that these algorithms detect are classified as gusts whereas symmetric shear features are rejected if their shear and momentum are insignificant; otherwise they are classified as low level vortices. To track gusts researchers used second order polynomials in the range-azimuth plane. It is shown that predicted gust locations from simple linear projections of the least square fitted curves agree very well with actual gust locations. GRA

N86-14806# Naval Research Lab., Washington, D. C.
OPTICAL/IR CHARACTERISTICS OF ALKALI HALIDE AEROSOL CLOUDS OVER THE OCEAN
S. G. Gathman and R. E. Larson 5 Sep. 1985 32 p
(RR0-2402)
(AD-A158446; NRL-MR-5622) Avail: NTIS HC A03/MF A01 CSCL 20/6

Artificial fogs grown on hygroscopic alkali halide (Salty Dog) nuclei were produced over the North Atlantic Ocean using 180 pound pyrotechnic generators deployed from the USNS LYNCH. Canopy clouds were produced when heat from the burn carried the material aloft, if the relative wind at the ship was small during the burn. Surface clouds were formed if the burn took place while the ship was in motion relative to the surrounding air. When the wind speed was less than the ship's speed, it was possible to re-enter the surface clouds and make measurements on the size distribution of the aerosol particles. Shipboard instrumentation measured the particle size distributions and light scattering characteristics of those clouds which the ship could enter. The agreement between measured extinction and that calculated form particle size was good. Only remote sensing could be used for canopy clouds, and sun photometer measurements of the light extinction by the canopy clouds were consistent with theoretical estimates of changing particle size distributions. The ship also carried instrumentation to monitor ship position, speed and direction, sea surface and air temperatures at various altitudes, radiosonde equipment, and the NRL eye safe lidar. GRA

N86-14807# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CLIMATES AND MAN (SELECTED ARTICLES)
Y. N. Shvareva, Z. Makhamatillayev, G. P. Lazarenko, Y. K. Kurbansho, and A. B. Babdasaryan 9 Aug. 1985 175 p Transl. into ENGLISH from the book "Klimat i Chelovek" Moscow, 1972 p 29-46, 149-208, 215-217
(AD-A158452; FTD-ID(RS)T-1542-84) Avail: NTIS HC A08/MF A01 CSCL 04/2

Among the topics discussed are the following: radiation characteristics and basic laws governing the distribution of weather in the territory of the USSR; climate of Uzbekistan in weathers; coupling of the weather of Dushanbe and Khorog (PAMIR); vertical zonation of the local weather and its bioclimatic estimation; formation and distribution of the local weather in Azerbaijan; climate of the North Caucasus and Lower Don and its use by man; bioclimatic evaluation of the Black Sea coast for purposes of rest, by N. A. Danilova. GRA

N86-14808# Montana State Univ., Bozeman. Dept. of Civil Engineering and Engineering Mechanics.
INVESTIGATION OF THE MULTIAXIAL PROPERTIES OF SNOW AT HIGH RATES OF DEFORMATION Final Report, 1982 - 1985
R. L. Brown 1 Aug. 1985 9 p
(Contract DAAG29-82-K-0127)
(AD-A158532; ARO-18730.3-GS) Avail: NTIS HC A02/MF A01 CSCL 08/12

A constitutive equation was developed to describe the behav-

ior of snow subjected to high rate multiaxial deformations. This constitutive law is therefore usable in the analysis of stress waves in snow, vehicle mobility in snow, and terminal ballistics, as it is capable of describing the response of the material to deformations which occur at high rates and result with large strains. In addition, the constitutive theory is defined in terms of the microstructural properties of the material, i.e., grain size, bond diameter, pore size, bond length, bond number density, and specific surface area. A stress wave program was also carried out to provide the data with which to evaluate the constitutive theory and to make any empirical adjustments necessary. This process is still being carried out. Finally, effort was devoted to developing a stereological theory with which to evaluate the microstructure of the material. This effort resulted with the ability to calculate all of the microstructural properties mentioned above, irrespective of grain size and shape distributions. GRA

N86-14809# Dugway Proving Ground, Utah.
A CUMULONIMBUS AND THUNDERSTORM STEPWISE MULTIPLE REGRESSION OBJECTIVE FORECAST STUDY FOR SALT LAKE CITY Technical Report, Sep. 1983 - May 1985
A. W. Waldron, Jr. Aug. 1985 315 p
(AD-A159275; AD-E301788; DPG-FR-85-013) Avail: NTIS HC A14/MF A01 CSCL 04/2

The University of California BMDP2R Stepwise Multiple Regression program was used to obtain prediction equations for cumulonimbus or precipitation and for thunder at the Salt Lake City airport weather station. Fourteen years of data for the five months May through September were analyzed. The data were broken into two time periods; the spring and fall months May to June 14 and September and the summer months June 15 to August 31. The Observed 12Z Salt Lake City radiosonde (RAOB) was used to forecast the probability of occurrence of cumulonimbus or thunder from RAOB time to 2400 MST (O700Z). The five year independent data 12Z RAOB skill scores for cumulonimbus were 0.62 for spring and fall and 0.50 for the summer months. The 12Z RAOB thunder equation independent data skill scores were 0.26 for spring and fall and 0.36 for the summer months. Tables are presented to assist the forecaster in determining the probability of occurrence of cumulonimbus or thunder for the various regression equations and for single predictors. High and low probability forecasts can be used to improve the forecast confidence. Single predictors such as the average relative humidity from the surface to 400 millibars for cumulonimbus or lifting index or precipitable water for thunder can be used to obtain skill scores slightly smaller than those of the best equations. Author (GRA)

N86-14810# Naval Postgraduate School, Monterey, Calif.
INTERACTION OF FRONTS WITH TOPOGRAPHY M.S. Thesis
D. A. Zankofski Jun. 1985 96 p
(AD-A159456; AD-E950749) Avail: NTIS HC A05/MF A01 CSCL 04/2

This study examines the formation of a front over a mountain due to a pre-existing deformation field. The dependent variables are assumed to be independent of x. The hydrostatic Boussinesq equations are used with no diffusion of heat or momentum. A modified coordinate system similar to Phillips' sigma system is used. The model is bounded at the top by a rigid plane and periodic boundary conditions are used in the horizontal. The solutions show the formation of a front within a finite period of time that tilts toward the cold air. The frontogenesis experiments with a mountain of wavelength 3600 km showed negligible topographic effects. Author (GRA)

N86-14811# Naval Postgraduate School, Monterey, Calif.
THE INFLUENCE OF LARGE-SCALE 200 MB TROPICAL DIVERGENCE EVENTS ON THE MIDLATITUDE ZONAL FLOW OVER THE ASIA-PACIFIC REGION DURING THE 1983-1984 WINTER M.S. Thesis
K. G. Lum Jun. 1985 67 p
(AD-A159541) Avail: NTIS HC A04/MF A01 CSCL 04/2

Global band analysis grid point data produced by FNOC for the 1983 to 1984 winter season are used to study the daily variation of the midlatitude 200 mb zonal wind in relation to the divergence field. It is found that the enhancements of tropical divergence are well correlated with the intensification of the westerly jet in the midlatitudes. Three cases of the tropical divergence events were associated with tropical storm activities. This association asserts that westerly jet intensification is, in fact, a response to the tropical divergence enhancement, accepting the view that developed tropical storms are tropically-forced systems. A case of tropical divergence enhancement was also found to be attributable to a cold surge, reaffirming the importance of the cold surge related jet acceleration. Further, the study also confirms the downstream propagation of the jet streak; the existence of thermally indirect circulations at the jet exit region of the jet, both in the time-mean and in the transient motion fields. GRA

N86-14812# Air Force Environmental Technical Applications Center, Scott AFB, Ill.
REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO). PARTS A-F, CAPE ROMANZOF AFS, ALASKA Data Summary Report, Aug. 1977 - Nov. 1984
Jun. 1985 449 p
(AD-A159611; USAFETAC/DS-85/023) Avail: NTIS HC A19/MF A01 CSCL 04/2

A six-part statistical data summary of surface observation climatology for: Cape Romanzof AFS, Alaska. Summary consists of: Part A, Weather Conditions and Atmospheric Phenomena; Part B, Precipitation; Part C, Surface Winds; Part D, Ceiling and Visibility; Part E, Psychrometric Summaries; Part F, Pressure Summaries. See USAFETAC/TN-83/001 (AD-A132186), An Aid for Using the Revised Uniform Summary of Surface Weather Observations (RUSSWOs) for complete descriptions of contents and instructions for use. GRA

N86-14813# Air Force Environmental Technical Applications Center, Scott AFB, Ill.
EASTER ISLAND, CHILE LIMITED SURFACE OBSERVATIONS CLIMATIC SUMMARY (LISOCS), PARTS A, C-F Data Summary Report, Jun. 1975 - May 1985
Sep. 1985 275 p
(AD-A159612; USAFETAC/DS-85/052) Avail: NTIS HC A12/MF A01 CSCL 04/2

A statistical data summary of surface weather observation climatology for: Easter Island Chile. This summary is similar to the Revised Uniform Summary of Surface Weather Observations (RUSSWO), but is based on data collected from limited-duty weather observing stations; i.e., those that take weather observations less than 24 hours a day, 7 days a week. The summary is in five parts: Part A, Weather Conditions and Atmospheric Phenomena; Part C, Surface Winds; Part D, Ceiling and Visibility; Part E, Psychrometric Summaries; and Part F, Pressure Summaries. Note that Part B Precipitation is omitted. See USAFETAC/TN-83/001 (AD-A132186), An Aid for Using The Revised Uniform Summary of Surface Weather Observations (RUSSWOs), for complete descriptions of contents and instructions for use. GRA

N86-14814# Air Force Environmental Technical Applications Center, Scott AFB, Ill.
REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO). PARTS A-F, FORT KNOX/GODMAN AAF, KENTUCKY Data Summary Report, Dec. 1974 - Nov. 1984
Mar. 1985 474 p
(AD-A159613; USAFETAC/DS-85/009) Avail: NTIS HC A20/MF A01 CSCL 04/2

A six-part statistical data summary of surface observation climatology for: Fort Knox, Kentucky. Summary consists of: Part A, Weather Conditions and Atmospheric Phenomena; Part B, Precipitation; Part C, Surface Winds; Part D, Ceiling and Visibility; Part E, Psychrometric Summaries; Part F, Pressure Summaries. See USAFETAC/TN-83/001 (AD-A132186), An Aid for Using the Revised Uniform Summary of Surface Weather Observations

(RUSSWOs) for complete descriptions of contents and instructions for use. GRA

N86-14815# Air Force Environmental Technical Applications Center, Scott AFB, Ill.
REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO). PARTS A-F, SEYMOUR JOHNSON AFB, NORTH CAROLINA Data Summary Report, Mar. 1975 - Feb. 1985
Mar. 1985 468 p
(AD-A159614; USAFETAC/DS-85/018) Avail: NTIS HC A20/MF A01 CSCL 04/2

A six-part statistical data summary of surface observation climatology for: Seynour Johnson AFB, North Carolina. Summary consists of: Part A, Weather Conditions and Atmospheric Phenomena; Part B, Precipitation; Part C, Surface Winds; Part D, Ceiling and Visibility; Part E, Psychrometric Summaries; Part F, Pressure Summaries. See USAFETAC/TN-83/001 (AD-A132186), An Aid for Using the Revised Uniform Summary of Surface Weather Observations (RUSSWOs) for complete descriptions of contents and instructions for use. GRA

N86-14816# Air Force Environmental Technical Applications Center, Scott AFB, Ill.
REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO). PARTS A-F, MARCH AFB, CALIFORNIA Data Summary Report, Sep. 1974 - Aug. 1984
Feb. 1985 494 p
(AD-A159615; USAFETAC/DS-85/007) Avail: NTIS HC A21/MF A01 CSCL 04/2

A six-part statistical data summary of surface observation climatology for: March AFB, California. Summary consists of: Part A, Weather Conditions and Atmospheric Phenomena; Part B, Precipitation; Part C, Surface Winds; Part D, Ceiling and Visibility; Part E, Psychrometric Summaries; Part F, Pressure Summaries. See USAFETAC/TN-83/001 (AD-A132186), An Aid for Using the Revised Uniform Summary of Surface Weather Observations (RUSSWOs) for complete descriptions of contents and instructions for use. GRA

N86-14817# Colorado Univ., Boulder. Cooperative Inst. for Research in Environmental Sciences.
SURGING AS A POTENTIAL RESPONSE OF ICE SHEETS TO CO2-INDUCED CHANGES IN THE POLAR ENVIRONMENT (SPICAE) Progress Report, Sep. 1984 - Aug. 1985
U. Radok Aug. 1985 26 p
(Contract DE-AC02-84ER-60197)
(DE85-017431; DOE/ER-60197/6) Avail: NTIS HC A03/MF A01

A numerical flow-band model of a polar ice stream that includes dynamic interaction with a floating ice shelf has been developed. The model includes a basal sliding relationship that is calibrated by assuming that the future sliding behavior of the ice stream will be analogous to its present sliding behavior. The model can be used to simulate the response of an ice stream to changes in back pressure from an ice shelf, changes in the accumulation rate or changes in sea level. DOE

N86-14818# Oak Ridge National Lab., Tenn.
METHODS OF UNCERTAINTY ANALYSIS FOR A GLOBAL CARBON DIOXIDE MODEL
R. H. Gardner and J. R. Trabalka Jul. 1985 44 p refs
(Contract DE-AC05-84OR-21400)
(DE85-015812; DOE/OR-21400/4) Avail: NTIS HC A03/MF A01

Monte Carlo methods of uncertainty analysis were applied to a World Carbon Cycle Model to examine the time dependent variability of predicted values of atmospheric carbon dioxide and relate them to uncertainties associated with model parameters. The details of the statistical methods used to reveal significant relationships between model parameters and predictions are presented. The results show that when emission rates of carbon from fossil fuel combustion are considered a part of the CO2 release scenario (e.g., fixed for all model simulations): (1) predicted atmospheric concentrations of carbon dioxide show relatively low levels of variability through time; (2) parameter importance levels are time dependent; and (3) model parameters associated with absorption of carbon in the ocean and release rates of carbon from forest clearing account for over 90% of the uncertainty of predicted atmospheric CO2 in the year 2075. The implementation and refinement of these techniques for the carbon cycle model now make it possible to examine, in a manner consistent with available data, the uncertainties associated with other scenarios of carbon emission rates and to compare the results in a quantitative manner with those of other models. DOE

N86-14819# Hochschule der Bundeswehr, Munich (West Germany). Forschungsschwerpunkt Simulation und Optimierung Deterministischer und Stichastischer Dynamischer Systeme.
EVALUATION OF MEASURED BACKSCATTER COEFFICIENTS WITH A VIEW TO EXISTING WIND FIELDS [AUSWERTUNG VON GEMESSENEN RUECKSTREUKOEFFIZIENTEN IM HINBLICK AUF BESTEHENDE WINDFELDER]
K. J. Schwenzfeger Apr. 1985 98 p refs In GERMAN
Avail: NTIS HC A05/MF A01

Monte Carlo simulations were performed to determine wind direction and wind velocity from scatterometer measurements of two different satellite systems. The measurements were made from the geostationary orbit for one measuring direction and several polarizations. It is shown that under certain assumptions a scalar wind field can be identified with good accuracy. Determination of the wind direction is more complicated and requires further investigations. Measurements of two geosynchronous satellites with two polarizations were performed. The wind vector field can under certain assumptions be identified with certainty. No attempt was made to eliminate the system ambiguities, especially in the wind direction. Author (ESA)

N86-14820# Royal Netherlands Meteorological Inst., De Bilt. Afd. Dynamische Meteorologie.
DEVELOPMENT OF GUIDANCE FORECASTS AT THE ROYAL NETHERLANDS METEOROLOGICAL INSTITUTE (KNMI). PART 3: PROBABILITY OF THUNDERSTORM ACTIVITY
S. Kruizinga 1985 21 p refs
(KNMI-TR-54-Pt-3; B8564431-Pt-3; ISSN-0169-1708) Avail: NTIS HC A02/MF A01

An objective forecast scheme, based on the Model Output Statistics (MOS) approach for predicting the probability of thunderstorms in the Netherlands was developed. This scheme is MOS-equations which computes the forecast probabilities from the output of the numerical model of the European Centre for Medium range Weather Forecasts. Lead times range from 48 to 144 hrs., mainly to support the notion that the public weather forecast is reliable. Author (ESA)

N86-14821# Royal Netherlands Meteorological Inst., De Bilt. Afd. Dynamische Meteorologie.
PROCEDURES USED IN THE BOUNDARY LAYER HEIGHT AND WIND ANALYSIS FOR THE PHOXA-PROJECT Final Report
G. J. Cats, J. Reiff, and C. A. Engeldal 1985 28 p refs
(KNMI-TR-64; ISSN-0169-1708) Avail: NTIS HC A03/MF A01

The atmospheric boundary layer height field and mesoscale wind field over Western Europe were analyzed in a project to model photochemical and acid transports and deposition, the so-called PHOXA-project. Analysis procedures are described. It is concluded that the produced analyses are reliable and consistent with a priori expectations. The difference in land and sea regime of the boundary layer height is clearly analyzed, the space and time resolution of this height over the European continent is satisfactory. Evidence that the mesoscale wind analyses describe significantly small scale phenomena, that would not be presented in synoptic scale analyses is presented. Author (ESA)

N86-14822# Royal Netherlands Meteorological Inst., De Bilt. Afd. Fysische Meteorologie.
MODELING OF THE DAILY GLOBAL RADIATION SUMS IN A NUMBER OF SPECTRAL BANDS BY MEANS OF MEASURE-

MENTS EXECUTED IN UKKEL (BELGIUM) [MODELLERING VAN DE DAGSOMMEN VAN DE GLOBALE STRALING IN EEN AANTAL SPECTRALE BANDEN MET BEHULP VAN IN UKKEL UITGEVOERDE METINGEN]
W. H. Slob 1985 47 p refs In DUTCH
(KNMI-TR-65; B8566392; ISSN-0169-1708) Avail: NTIS HC A03/MF A01

The average daily global radiation sums in seven 100 nm spectral bands ranging from 300 to 1000 nm were determined per decade for the Dutch meteorological stations De Bilt, De Kooy, Eelde, Vlissingen and Beek. In Ukkel daily sums of the seven bands were measured during 1 yr. The measurements are modelled with parameters such as the fraction of radiation that reaches Earth, the inverse of the sinus of the Sun height, and combinations of both. Via multiple linear regression, best regression equations are found for each band. The models are applied to daily values of the stations during the period 1971 to 1982.
Author (ESA)

N86-14823# Royal Netherlands Meteorological Inst., De Bilt.
NICAULAUS CRUQUIUS (1678-1754) AND HIS METEOROLOGICAL OBSERVATIONS
A. F. V. vanEngelen and H. A. M. Geurts 1985 152 p refs
(KNMI-165-Pt-4) Avail: NTIS HC A08/MF A01

The life and research of the Dutch meteorologist Nicolaus Cruquins are described. He was the first person to present weather data graphically. His daily observations for the period 1706 to 1734 are used to compile mean monthly temperature series.
Author (ESA)

N86-14824# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Applied Mathematics.
CONSTRUCTION AND ANALYSIS OF A LOW ORDER SPECTRAL MODEL OF THE BAROTROPIC POTENTIAL VORTICITY EQUATION IN A BETA CHANNEL
H. E. deSwart Jan. 1985 17 p refs Sponsored by Netherlands Foundation for the Technical Sciences
(CWI-AM-R8501; B8565128) Avail: NTIS HC A02/MF A01

A low order spectral model is derived from the barotropic potential vorticity equation in a beta channel. The conservative and dissipative cases are distinguished. Both systems are analyzed mathematically. The dissipative model is similar to that of Egger (1981), however, a different value for the Beta parameter and a constant width of the channel are taken, changing quantitative aspects.
Author (ESA)

N86-14825# National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Sciences Group.
OPERATIONAL METEOROLOGY OF CONVECTIVE WEATHER. VOLUME 2: STORM SCALE ANALYSIS
C. A. Doswell Apr. 1985 245 p
(PB85-226959; NOAA-TM-ERL-ESG-15) Avail: NTIS HC A11/MF A01 CSCL 04B

A useful convection storm classification scheme is developed. The fundamental aspects of convection meteorology are presented. A wide range of storm scale meteorological topics are considered. Precipitation physics are examined in detail in order to provide basic physical understanding of how thunderstorms work.
E.R.

N86-14826# Chicago Univ., Ill. Dept. of Geophysical Sciences.
DOWNBURST: MICROBURST AND MACROBURST
T. T. Fujita [1985] 131 p refs
(PB85-148880; SMRP-RP-210; LC-85-50115) Copyright. Avail: NTIS HC A07/MF A01 CSCL 04B

Until several years ago, microbursts and tornadoes were regarded as being unrelated. An amazing similarity between these severe storms is presented. A tornado is an intense misocyclone in which the swirling air rushes upward, while a microburst, at inflow and downflow levels, is surrounded by a misocyclone in which the swirling air rushes downward. The history of downburst identification is presented, as is some observations of macrobursts and microbursts. How microburst is related to some aircraft accidents is also studied.
Author

N86-14827# National Weather Service, Salt Lake City, Utah.
AEV (AFOS ERA VERIFICATION) LOCAL VERIFICATION FOR AVIATION, PRECIPITATION AND TEMPERATURE PROGRAMS: AV, REL, TEM (MAY 1985 REVISION)
L. B. Dunn May 1985 37 p Previously announced as N85-30568
(PB85-210342; NOAA-WS-WRCP-42) Avail: NTIS HC A03/MF A01

These three programs take advantage of the locally archived verification data provided by the AEV software. AFOS alphanumeric and graphic products are created which display statistical results for local and MOS forecasts. The programs are extremely flexible in allowing the user to define the criteria of verification. The programs are written in Data General FORTRAN IV, revised 5.57. The programs are initiated from the AFOS ADM or the Dasher and AFOS must be running.
Author (GRA)

N86-14730# Deutscher Wetterdienst, Hamburg (West Germany).
THE EXTRATERRESTRIAL SOLAR SPECTRUM AND ITS CHANGE IN THE ATMOSPHERE [DAS EXTRATERRESTRISCHE SONNENSPEKTRUM UND SEINE VERAENDERUNG IN DER ATMOSPHERE]
F. Kasten *In* Physik.-Tech. Bundesanstalt Solar Elements: Measuring Tech. and Physical Fundamentals Oct. 1984 p 11-38 refs In GERMAN (For primary document see N86-14728 05-44)
Avail: NTIS HC A13/MF A01

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N86-14828 California Univ., San Diego.
SAMPLING TURBULENCE IN THE STRATIFIED OCEAN: STATISTICAL CONSEQUENCES OF STRONG INTERMITTENCY Ph.D. Thesis
Mark Alan Baker 1985 69 p
Avail: Univ. Microfilms Order No. DA8515587

Turbulence and turbulent mixing in the ocean are strongly intermittent in amplitude, space and time. The degree of intermittency is measured by the variances alph sq of the logarithms of the velocity and temperature dissipation rates ln epsilon and ln sub chi, respectively. Confidence limits for the maximum likelihood estimator of the mean of a lognormal random variable are determined by Monte Carlo techniques and by theoretical modelling. It is generally accepted that canonical estimates of the main thermocline vertical eddy diffusivity of order 1 sq cm/s, based on bulk property models are inconsistent with much smaller values inferred, ignoring intermittency effects, from thermocline microstructure measurements. Intermittency may cause qualitative and quantitative undersampling errors: minimum values in the vertical profiles of mean dissipation rates are commonly inferred from individual profiles at the seasonal thermocline depth and the equatorial undercurrent high-velocity core depth where maxima may actually exist. From the new confidence intervals, such minima are shown to be artifacts of the extreme intermittency in these strongly stratified layers.
Dissert. Abstr.

N86-14829# Naval Ocean Research and Development Activity, Bay St. Louis, Miss.
AIRBORNE ELECTROMAGNETIC BATHYMETRY Final Report
I. J. Won and K. Smits Apr. 1985 23 p
(AD-A158640; NORDA-94) Avail: NTIS HC A02/MF A01 CSCL 08/10

An experimental airborne electromagnetic (AEM) survey was carried out in the Cape Cod Bay area to investigate the potential of extracting bathymetric information for a shallow ocean. A commercially available Dighem III AEM system was used for the survey without any significant modification. The helicopter-borne system operated at 385 Hz and 7200 Hz, both in a horizontal coplanar configuration. A concurrent ground truth survey included

extensive acoustic soundings, as well as spot water conductivity measurements. Because of a lack of knowledge about the absolute system calibration figures, an acoustic-sounding calibration was made for each flight line using a small portion of AEM data to derive the zero-level signal, amplitude, and phase calibration factors for each coil pair. The interpreted bathymetric profiles show excellent agreement with corresponding acoustic depth profiles up to one (possibly more) skin depth of the source frequency. It is envisioned that with further improvements in hardware and software, the bathymetric resolution may extend beyond the skin depth. AEM data can also produce (as by-products) conductivity profiles of both seawater and bottom sediments that may find potential applications in mine warfare and offshore geotechnical engineering works. GRA

N86-14830# Army Cold Regions Research and Engineering Lab., Hanover, N. H.
ANALYSIS OF RIVER WAVE TYPES
M. G. Ferrick Jun. 1985 25 p
(AD-A158683; CRREL-85-12) Avail: NTIS HC A02/MF A01 CSCL 08/8

In this paper, we consider long-period, shallow-water river waves that are a consequence of unsteady flow. River waves result from hydroelectric power generation or flow control at a dam, the breach of a dam, the formation or release of an result form hydroelectric power generation or flow control at a dam, the breach of a dam, the formation or release of an ice jam, and rainfall/runoff processes. The Saint-Venant equations are generally used to describe river waves. Dynamic, gravity, diffusion, and kinematic river waves have been defined, each corresponding to different forms of the momentum equation and each applying at some subset of the overall range of river hydraulic properties and time scales of wave motion. However, the parameter ranges corresponding to each wave description are not well defined, and the transitions between wave types have not been explored. This paper is an investigation into these areas, which are fundamental to river wave modeling. The analysis is based on the concept that river wave behavior is determined by the balance between friction and inertia. The Saint-Venant equations are combined to form a system equation that is written in dimensionless form. The dominant terms of the system equation change with the relative magnitudes of a group of dimensionless scaling parameters that quantify the friction/inertia balance. These scaling parameters are continuous, indicating that the various types of river waves and the transitions between them form a spectrum. Additional data describing the physical variability of rivers and waves are incorporated int the analysis by interpreting the scaling parameters as random variables. GRA

N86-14831# Naval Postgraduate School, Monterey, Calif.
THE EQUILIBRIUM MIXED LAYER DEPTH IN THE TROPICAL ATLANTIC. THE ROTATION STRESS AND PENETRATION OF RADIATION EFFECTS M.S. Thesis
J. F. F. A. Gaspar Jun. 1985 77 p
(AD-A158999) Avail: NTIS HC A05/MF A01 CSCL 08/10

This thesis examines the effects of the rotation stress mechanism and the penetration of shortwave radiation below the sea-surface in determining a one dimensional equilibrium mixed layer depth. Starting with the Obukhov-scale equilibrium theory for the surface ocean boundary layer, a revised equilibrium theory, which includes rotation stress and radiation effects, is presented. This new theory is applied using climatological boundary conditions for the tropical Atlantic Ocean and the results are compared with the observed climatological mixed layer depth. In general, the response of the revised model is an improvement over the Obukhov theory alone. Because the quality of the results is limited by uncertainties in the boundary conditions, no detailed evaluation of the model response is justifiable. However, it is concluded here that the physical mechanisms of rotation stress and penetration of radiation are important in determining a steady-state equilibrium depth of mixing for the tropical Atlantic. GRA

N86-14832# Naval Research Lab., Washington, D. C.
PATCHINESS OF SMALL-SCALE TEMPERATURE FLUCTUATIONS IN THE SEASONAL THERMOCLINE: RESULTS USING A PRELIMINARY PATCH PROCESSOR ALGORITHM
J. P. Dugan, B. S. Okawa, and G. O. Marmorino 16 Sep. 1985 51 p
(AD-A159056; NRL-MR-5649) Avail: NTIS HC A04/MF A01 CSCL 08/10

An algorithm is documented which is useful for visualizing patches of fine-scale activity in the upper ocean. It also gives estimates of elementary patch statistics. The algorithm is applied to a approx 55 km by approx 30 m section of temperature data obtained with a towed array of thermistors in the seasonal thermocline in the Sargasso Sea in late summer. Activity on horizontal wavelengths of 1 to 10 meters is shown to be intermittent, with the size of energetic patches being tens of meters to order one kilometer long and 0.5 to 10 meters high. The length-to-height ratio, on the average, is greater than 100, approaching the ratio of the buoyancy to the inertial frequency. Also, the rms amplitude of the fluctuations in the patches is, on the average, independent of patch size. GRA

N86-14833# Naval Postgraduate School, Monterey, Calif.
A MODEL STUDY OF THE EQUATORIAL OCEAN SURFACE TEMPERATURE RESPONSE TO WIND FORCING DURING EL NINO M.S. Thesis
J. J. Waterreus Jun. 1985 68 p
(AD-A159477) Avail: NTIS HC A04/MF A01 CSCL 08/10

This thesis investigated processes that contribute to large scale equatorial SST variability, and by comparison with observation, verify the realism of the model's thermal response to prescribed forcing in the atmosphere. More realistic thermodynamic processes are incorporated in the ocean part of Rennick's (1985) coupled ocean-atmosphere model and an examination of its response to prescribed wind forcing is conducted. The dynamic ocean model is based on the shallow water momentum equations forced by a surface wind stress. It is linearized about a motionless state with a zonally sloping pycnocline depth which is in balance with the surface stress caused by the zonal wind of the atmospheric basic state. This study investigates the effect of turbulent vertical mixing of heat, in contrast to horizontal advection, for the generation of SST anomalies in the equatorial region of the Pacific. Results showed that the SST anomaly produced by turbulent mixing was two orders of magnitude smaller than, and 90 deg out of phase with, the SST anomaly generated by horizontal advection. GRA

N86-14834# Columbia Univ., Palisades, N.Y. Geological Observatory.
ASSESSMENT OF CARBON DIOXIDE SINK/SOURCE IN THE OCEANIC THE AREAS: THE RESULTS OF 1982 - 1984 INVESTIGATION Final Technical Report
T. Takahashi, D. W. Chipman, W. Smethie, Jr., J. Goddard, S. Trumbore, G. G. Mathieu, and S. Sutherland Jul. 1985 56 p refs
(Contract DE-AC02-81ER-60000)
(DE85-016461; DOE/ER-60000/T2) Avail: NTIS HC A04/MF A01

The oceanic CO2 sink/source relationships over the tropical Atlantic Ocean, the eastern North and South Pacific Ocean, and the Ross Sea were investigated. The net CO2 flux across the air-sea interface over these areas was estimated. Measurements of the Kr-85 in atmospheric samples collected over the central Pacific along the 155(0)W meridian were initiated. Based on the measurements of the difference between the pCO2 values in the surface ocean water and the atmosphere and of the radon-222 distribution in the upper water column, we have found that the average net flux for the Atlantic equatorial belt, 10(0)N-10(0)S, is 1.3 moles CO2/m(2).y out of the ocean, when our measurements were made in November 1982 through February 1983. The surface water pCO2 data obtained over the eastern North and South Pacific during the period, October 1983 through January 1984, show that the equatorial zone between 2(0)N and 8(0)S is an intense CO2 source area, whereas a 10(0) wide belt coinciding with the area

between the Subtropical and Antarctic Convergence Zones is a strong CO2 sink area. The temperate gyre area located north of about 5(0)N and that located between 8(0)S and 35(0)S are nearly in equilibrium with atmospheric CO2. The surface water pCO2 data obtained in the Southern Ocean during the past ten or more years suggest strongly the existence of an intense CO2 sink zone, the Circumpolar Low pCO2 Zone, which is about 10(0) wide in latitude and centered at about 50(0)S surrounding the Antarctica Continent. The surface water of the Ross Sea is found to be a strong CO2 sink during the period January 23 through February 12, 1984. Because of contamination problems, no reliable data for atmospheric krypton-85 have been obtained. DOE

N86-14835# Geological Survey, Reston, Va.
SUBMARINE CANYON DEPOSITS, CENTRAL CALIFORNIA COAST AND THEIR POSSIBLE RELATION TO AN EOCENE LOW SEA-LEVEL STAND
Victor M. Seiders and James M. Joyce 1985 19 p refs
(TI85-902203; USGS-BULL-1539) Avail: NTIS HC A02/MF A01

A cliff exposure in the northern Santa Lucia Range is interpreted to represent the north margin of an Eocene submarine canyon. The exposure shows an unconformity between The rocks Sandstone Member of the Reliz Canyon Formation and the underlying crystalline basement rocks. Sandstone beds overlies the unconformity at an angle of about 20. Stratigraphic relations exposed nearby show that about 220 m of the Reliz Canyon and Church Creek Formations pinches out northward against the basement across a distance of about 900 m. This corresponds to an original southward slope of the unconformity of about 14 deg Farther south, an even steeper slope to the north may be indicated, but a fault of uncertain horizontal displacement intervenes. The Reliz Canyon Formation seems to have been deposited in a small northwest-trending submarine canyon in the vicinity of the exposed unconformality; elsewhere in the region the Reliz Canyon Formation may have been deposited in two other canyons or restricted basins. Fossil data show that the voluminous sand of the Rocks Sandstone Member was deposited near the early-middle Eocene boundary, a postulated time of worldwide low sea level. DOE

N86-14836# Institute of Oceanographic Sciences, Wormley (England).
QUASI-GEOSTROPHIC OCEAN MODELS EMPLOYING SPECTRAL METHODS. PART 1: THEORETICAL BACKGROUND
C. F. Rogers (Science and Engineering Research Council, Chilton, Engl.) 1984 59 p refs Sponsored by UK Science and Engineering Research Council and Westlands Helicopter Public Ltd. Company
(IOS-191-Pt-1) Avail: NTIS HC A04/MF A01

The theoretical background to a set of three quasi-geostrophic ocean models which use spectral methods to represent the horizontal variation of the dynamic pressure is outlined (Chebyshev channel model; barotropic sine channel model; basin model). Depth variation is represented in terms of the normal modes of a linearized flat bottom and unforced ocean. Modal vorticity equations form the basic dynamical equations describing the evolution of the ocean systems. The full three dimensional structure is regained by summing over all the contributing normal modes. Author (ESA)

N86-14837# Royal Netherlands Meteorological Inst., De Bilt. Afd. Oceanografisch Onderzoek.
JUDGEMENT OF MEASURING NETWORK NORTH SEA WAVE DATA PROCESSED BY THE CONTROL AND INFORMATION CENTER (CIC) SYSTEM (1984) IN HOOK OF HOLLAND [BEOORDELING VAN GOLFGEGEVENS VAN HET MEETNET NOORDZEE BEWERKT DOOR HET NIEUWE CIC-SYSTEEM (1984) IN HOEK VAN HOLLAND]
E. Bouws 1985 30 p refs In DUTCH
(KNMI-TR-62; B8564432; ISSN-0169-1708) Avail: NTIS HC A03/MF A01

Real time on-line North Sea wave data, postprocessed user tape data, and punched tape data processed at the Royal Dutch Meteorological Institute (KNMI), are compared with regard to wave spectra and frequencies, and statistical results of time series. A disturbance free series of 144 wave measurements of a station from 27 March to 15 April is composed. Although a partly automated quality control is necessary, most data are at least equivalent to the old ones. For wave processing, results show slight frequency response deviations. Author (ESA)

N86-14838# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Applied Mathematics.
ON THE THEORY OF TOPOGRAPHIC VORTICITY PRODUCTION BY TIDAL CURRENTS
N. M. Temme and J. T. F. Zimmerman (Netherlands Inst. for Sea Research) Feb. 1985 23 p refs
(CWI-AM-R8506; B8565133) Avail: NTIS HC A02/MF A01

Starting from the shallow water equations of a homogeneous rotating fluid, the equation describing the evolution of vorticity induced by a fluctuating bottom topography is derived. It is shown that nonlinear vorticity advection can be reduced to a quasilinear form in the limit of small amplitude topography and for the topographic horizontal length scale being much smaller than the length of a tidal gravity wave. Topographic vorticity is produced by planetary vortex stretching and differential bottom friction. For both mechanisms, the vorticity response functions at the basic forcing frequency and all its higher harmonics, as well as the residual components, are shown to be given by sums of products of Bessel functions. The exact shape of the residual velocity field for a one-dimensional step-like bottom topography is calculated. In the absence of vorticity diffusion the residual velocity vanishes exactly outside a region of twice the tidal excursion length scale, in contrast of the result derived by the method of harmonic truncation. Author (ESA)

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N86-14839# Desmatics, Inc., State College, Pa.
A NONLINEAR REGRESSION PROCEDURE FOR EVOKED POTENTIAL DATA ANALYSIS
C. A. Mauro Jun. 1985 47 p
(Contract N00014-79-C-0128)
(AD-A157680; TR-112-18) Avail: NTIS HC A03/MF A01 CSCL 06/19

The recording and subsequent analysis of evoked potential activity has proven useful for the evaluation of neutral dysfunction resulting from impact acceleration injury involving the head and neck. In animal impact acceleration experiments involving Rhesus monkeys, somatosensory evoked potentials showed an increase in latency following nonlethal experiments. In order to assess quantitatively and objectively the amplitude and duration of the latency effect following impact acceleration, a nonlinear mathematical model has been proposed. This technical report describes a nonlinear regression procedure for fitting the proposed model directly to empirical latency data. A FORTRAN computer program listing is provided. Author (GRA)

N86-14840# Office of Naval Research, London (England).
BIOMATERIALS RESEARCH IN WEST GERMANY: AN ASSESSMENT Technical Report
T. C. Rozzell 14 Aug. 1985 15 p
(AD-A158951; ONRL-R-3-85) Avail: NTIS HC A02/MF A01 CSCL 06/5

West Germany is one of the leading countries in Europe for research in biomaterials. Researchers have developed a number of new techniques and methods utilizing a wide range of synthetic and natural materials for use in medicine. Exotic ceramics, metals, and plastics are being used both in animals and in humans for such things as tissue repair, wound coverings, drug delivery, and prostheses. The West German scientists, bioengineers, and clinicians are very aggressive in attacking new problems related to the use of biomaterials in therapy. GRA

N86-14841# Office of Naval Research, London (England).
BIOLOGICAL SCIENCES AND BIOELECTROMAGNETICS IN EUROPE Summary Technical Report
T. C. Rozzell 26 Aug. 1985 38 p
(AD-A159221; ONRL-R-4-85) Avail: NTIS HC A03/MF A01 CSCL 06/5

This report examines in detail bioelectromagnetics research in Europe and provides an overview of several aspects of general biomedical, biomaterials, and biotechnological research. GRA

N86-14842# Washington Univ., Seattle. Bioelectromagnetics Research Lab.
EFFECTS OF LONG-TERM LOW-LEVEL RADIOFREQUENCY RADIATION EXPOSURE ON RATS. VOLUME 9: SUMMARY Final Report, Jun. 1980 - Jul. 1984
A. W. Guy, C. K. Chou, L. L. Kunz, J. Crowley, and J. Krupp Aug. 1985 24 p
(Contract F33615-80-C-0612)
(AD-A159512; SR-29; USAFSAM-TR-85-64) Avail: NTIS HC A02/MF A01 CSCL 06/18

For 25 months 100 male SPF rats were exposed to pulsed 2450-MHz circularly polarized microwaves at an average power density of 0.48 mW/sq cm. Another 100 rats served as sham-exposed controls. This report summarizes the results of the eight previous volumes which reported on measurements of 155 parameters. For most of the parameters no statistical difference was found between the exposed and sham-exposed groups. This report discusses a few end-points that were statistically different. GRA

N86-14843# Kentucky Univ., Lexington.
PHYSIOLOGY/BIOCHEMISTRY OF PHOTOACTIVATION OF O2 EVOLUTION: PROBES FOR THE S-STATE PROTEIN Progress Report, 1 Jun. 1983 - 31 May 1985
G. M. Cheniae Mar. 1985 14 p refs
(Contract DE-AS05-83ER-13072)
(DE85-016834; DOE/ER-13072/1) Avail: NTIS HC A02/MF A01

This work details the conditions necessary to achieve routinely the complete photoactivation of virtually totally inactive water oxidizing complexes in NH2OH extracted leaf segments. The photoactivation process per se proved entirely similar to the process previously described for Mn deficient algae, Mn sufficient algae cultured heterotrophically, and NH2OH extracted algae. Further studies showed that without dark preincubation of NH2OH extracted leaf segments PS 2, but not PS 1, was susceptible to weak light photoinhibition (t1/2 approx. 2.5 min). Also reported are studies which kinetically characterize the photoinhibition process using NH2OH or Tris extracted isolated chloroplasts, prove the site affected resides on the oxidant side of PS 2, and give preliminary identification of the polypeptide which must be synthesized on chloroplast 70S ribosomes for the recovery from photoinhibition and for recovery of the capacity of PS 2 to carry-out photoactivation of the Mn-S-state enzyme. DOE

N86-14844# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Applied Mathematics.
QUANTITATIVE MODELS DESCRIBING THE KINETICS OF TUMOR CELL PROLIFERATION: A COMPARISON TO EXPERIMENTAL DATA
J. Aten (Amsterdam Univ.) and J. Grasman Dec. 1984 9 p refs
(CWI-AM-R8418; B8565125) Avail: NTIS HC A02/MF A01

Pedigrees of cells from a mouse osteosarcoma line are analyzed. The generation time data of cells of 12 pedigrees is used to estimate the parameters in two transition probability models of the cell cycle. In cultures perturbed by a change of culture medium, generation times are shorter than in control cultures. In the control cultures, seven cells with anomalously large division delays were deleted in the process of estimating the parameters in the transition probability models. In the data of pedigrees of irradiated cells such cases occur more frequently. This is a strong indication that a quiescent state must be introduced in the model of the cell cycle and that a delay due to DNA repair must be taken into account. In a test of the model of Brooks, Bennett and Smith (1980) the data of sister-sister correlations contained the necessary information to reject this model for cells a mouse osteosarcoma line. Author (ESA)

N86-14845# Joint Publications Research Service, Arlington, Va.
USSR REPORT: LIFE SCIENCES. BIOMEDICAL AND BEHAVIORAL SCIENCES
29 Jan. 1985 121 p Transl. into ENGLISH from various Russian articles
(JPRS-UBB-85-004) Avail: NTIS HC A06

Progress in U.S.S.R. biomedical and behavioral sciences is reported. Topics discussed include: a grotechnology; biochemistry; bionics; biotechnology; environment; human factors; laser effects; medicine; microbiology; public health; and radiation biology. For individual titles, see N86-14846 through N86-14847.

N86-14846# Joint Publications Research Service, Arlington, Va.
TECHNICAL VISION FOR ROBOTS **c74**
In its USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-85-004) 29 Jan. 1985 p 68 Transl. into ENGLISH from Tass (Dushanbe, USSR), 17 Nov. 1984 (For primary document see N86-14845 05-51)
Avail: NTIS HC A06

A new invention by scientists who have copied the structure of a human eye will help replace a human telescope-watching astronomer with a robot. It will be possible to provide technical vision not only for robot astronomers but also for their industrial fellow robots. So far, an artificial eye with dimensions close to those of a human eye discerns only black-and-white images. But already the second model of the eye is to perceive colors as well. Polymers which are suited for the role of the coat of an eye, lens, and vitreous body were applied. The retina has been replaced with a bundle of the finest glass filaments through which light rays get onto photomultipliers. They can be positioned outside the artificial eye. The main thing is to prevent great losses in the light guide. B.W.

N86-14847# Joint Publications Research Service, Arlington, Va.
RADIOSENSITIVITY OF ANIMALS IRRADIATED IN MODIFIED GAS MEDIUM: MODIFICATION OF CEREBRAL SYNDROME IN MICE BY HYPOXIC HYPOXIA AND HYPEROXIA DURING IRRADIATION
I. B. Ushakov and M. M. Abramov *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-85-004) 29 Jan. 1985 p 110-115 Transl. into ENGLISH from Radiobiologiya (Moscow), v. 24, no. 5, Sep.-Oct. 1984 p 693-697 (For primary document see N86-14845 05-51)
Avail: NTIS HC A06

The effect of breathing pure normobaric oxygen on the radiosensitivity of hemopoietic tissue and the small intestine was studied previously. The possible modifying action of hyperoxia and hypoxic gas mixtures (HGM) on the course of the cerebral syndrome was evaluated. Thus the authors who studied rabbits that succumbed to radiation, diagnosed a higher oxygen demand in the irradiated animals and recommended the use of oxygen therapy in X-ray treatment of head tumors. Irradiation of the heads of mice with 8 meV electrons in doses greater than 350 Gr produced what the authors believe to be a paradoxical result: Pure normobaric oxygen had a protective effect, as is true for anoxia, though the effect was significantly less pronounced. Presence of an oxygen effect (aggraviation by oxygen and protection by HGM) was demonstrated with radiation doses of 0.052-0.258 Kl (expansion unknown)/kg and 47-123 Gr [6]. In the latter case, however, the modifying effect was absent with radiation doses of 123-213.8 Gr. This paper evaluates possible modification of the cerebral syndrome in mice by a modified gas medium during gamma-irradiation of the head and torso. B.W.

N86-14848# Joint Publications Research Service, Arlington, Va.
USSR REPORT: SPACE BIOLOGY AND AEROSPACE MEDICINE, VOLUME 19, NO. 5, SEPTEMBER - OCTOBER 1985
O. G. Gazenko, ed. 25 Nov. 1985 147 p refs Transl. into ENGLISH of Kosmicheskaya Biologiya i Aviakosmicheskaya

Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 96 p (JPRS-USB-85-007) Avail: NTIS HC A07

Progress in Soviet space biology and aerospace medicine is reported. Topics discussed include: regular diet aspects of cosmonauts, metabolic distinctions in human red blood cells, hypokinesia, long term space flight effects, circulation and hemostasis in borderline hypertension, cardiac changes for dogs during extended hypokinesia, microelectronics, medical equipment tests, pharmacology, neurosciences. For individual titles, see N86-14849 through N86-14871.

N86-14849# Joint Publications Research Service, Arlington, Va.
HYGENIC ASPECTS OF REGULAR DIET OF FLIGHT PERSONNEL **c52**
I. G. Popov *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) 25 Nov. 1985 p 1-21 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 4-19 (For primary document see N86-14848 05-51)
Avail: NTIS HC A07

The nutritional approaches to daily meals for the flying personnel while on the ground are discussed from a historical point of view. It is indicated that the nutrition requirements for the chemical composition of the daily diet are related to the physiological norms accepted by the food science in the USSR and other countries at various stages of its development. It is shown that the present-day diets for the flying personnel have a high caloric value. The basic physiological and nutritional requirements for the daily diets are given. E.A.K.

N86-14850# Joint Publications Research Service, Arlington, Va.
METABOLIC DISTINCTIONS OF HUMAN RED BLOOD DURING LONG-TERM SPACEFLIGHTS **c52**
A. S. Ushakov, S. M. Ivanova, F. I. Ataullakhanov, A. V. Pichugin, Ye. I. Dubinskaya, S. S. Brantova, O. I. Labetskaya, V. P. Naydina, and A. Ye. Zezerov *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) 25 Nov. 1985 p 22-26 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 19-23 (For primary document see N86-14848 05-51)
Avail: NTIS HC A07

Before and after the 150-day Salyut-7 flight the crewmembers were examined for their red blood cell metabolism: major metabolic pathways (glycolytic and pentosophosphate), erythrocyte resistance, membrance permeability and lipid peroxidation rate. It is indicated that the metabolic and membrane changes are not pathological and can be classified as adaptive. E.A.K.

N86-14851# Joint Publications Research Service, Arlington, Va.
HUMAN BODY BIOMECHANICS AND MOVEMENTS AFTER 120-DAY ANTIORTHOSTATIC HYPOKINESIA **c52**
V. M. Zatsiorskiy, M. G. Sirota, B. I. Prilutskiy, L. M. Raytsin, V. N. Seluyanov, and L. G. Chugunova *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) 25 Nov. 1985 p 27-32 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 23-27 (For primary document see N86-14848 05-51)
Avail: NTIS HC A07

Data on body parameters (weight and circumference) and walking biomechanics after 120-day head-down tilt are presented. The exposure leads to changes in the antigravitational muscles which are assumed to be caused by relative changes in the fat and muscle components. Head-down tilt produces changes in the kinematic parameters of the walking process, the shape of support reactions, and losses in the walking efficiency. E.A.K.

N86-14852# Joint Publications Research Service, Arlington, Va.
FUNCTIONAL ACTIVITY OF HUMAN SEROTONINERGIC AND HISTAMINERGIC SYSTEMS DURING LONG-TERM ANTIORTHOSTATIC HYPOKINESIA **c52**
N. A. Davydova, Ye. Yu. Galkina, and A. S. Ushakov *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) 25 Nov. 1985 p 33-37 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 27-30 (For primary document see N86-14848 05-51)
Avail: NTIS HC A07

The functional activity of serotonin and histaminergic systems was investigated during 120-day head-down tilt. Serotonin excretion was increased until test day 70 and histamine excretion throughout the entire study. At the final stage of exposure the serotonin content decreased. Return to the normal motor activity stimulated the function of serotonin and histaminergic systems. E.A.K.

N86-14853# Joint Publications Research Service, Arlington, Va.
BODY POSITION DURING HYPOKINESIA, AND FLUID-ELECTROLYTE METABOLISM **c52**
V. B. Noskov, G. I. Kozyrevskaya, B. V. Morukov, Ye. M. Artamasova, and L. A. Rustamyan *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) 25 Nov. 1985 p 38-43 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 31-34 (For primary document see N86-14848 05-51)
Avail: NTIS HC A07

Two groups of five healthy volunteers each were exposed for 7 days to: (1) group 1 to horizontal bed rest and (2) group 2 to head-down tilt at -6 deg. The effect of body position on fluid-electrolyte metabolism and renal function was determined. During the control period, bed rest and the recovery period the consumption f fluids and mineral substances and their renal excretion were measured. The typical changes in fluid-electrolyte metabolism during head-down tilt developed faster than during horizontal bed rest. The fluid-electrolyte balance became negative in the course of the exposure and returned to normal during the recovery period. The group 2 subjects showed greater body weight losses due to both fluid and muscle mass losses. E.A.K.

N86-14854# Joint Publications Research Service, Arlington, Va.
MICROCIRCULATION AND CELLULAR HEMOSTASIS IN MEN WITH BORDERLINE ARTERIAL HYPERTENSION SUBMITTED TO NEUTRAL-TEMPERATURE DRY IMMERSION IN WATER **c52**
L. L. Kirichenko, V. V. Smirnov, and A. G. Yevdokimov *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) 25 Nov. 1985 p 44-49 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 35-38 (For primary document see N86-14848 05-51)
Avail: NTIS HC A07

Platelet hemostasis, microcirculation, blood viscosity and lipid metabolism were examined in 18 men with borderline hypertension and 8 healthy men before, during and after 7-day immersion. The exposure to thermoneutral dry water immersion produced hypercoagulopathic changes of platelet hemostasis in the healthy and hypertensive subjects. Platelet hemostasis returned to the pretest level in the subjects in 2 days and in the hypertensive subjects in 5 days after exposure. Prior to immersion the hypertensive subjects showed signs of capillarotrophic insufficiency which increased after exposure. On immersion day 3 the hypertensive subjects exhibited a higher blood viscosity and a larger content of total lipids and free fatty acids. E.A.K.

N86-14855# Joint Publications Research Service, Arlington, Va.
EFFECT OF POSITIVE PRESSURE BREATHING ON HEMODYNAMICS IN PATIENTS WITH BORDERLINE HYPERTENSION SUBMITTED TO WATER IMMERSION **c52**
V. N. Orlov, I. O. Fomin, A. E. Radzevich, and G. S. Leskin *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) 25 Nov. 1985 p 50-53 refs Transl. into ENGLISH from

Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 39-41 (For primary document see N86-14848 05-51)
Avail: NTIS HC A07

Patients with borderline hypertension were exposed, during immersion, to positive pressure breathing. During exposure cardiac output (CO), heart rate (HR), mean arterial pressure (MAP), total peripheral resistance (TPR), left ventricle work (W), blood content of head vessels (Qh), upper and lower lung lobes (Qul and Qll), liver (Ql) were measured. During immersion, CO and MAP decreased, HR and TPR increased slightly, and W diminished. Simultaneously, Qh, Qul and Qll increased significantly while Ql decreased considerably, indicating blood centralization during simulated microgravity. Courses of positive pressure breathing led to decreases in Qh, Qul, Qll and increase in Ql, i.e., they caused blood to be displaced from the head and lungs to the liver. It is concluded that the liver plays the role of a physiological pool which accumulates blood removed from the upper body by positive pressure. E.A.K.

N86-14856# Joint Publications Research Service, Arlington, Va.
ROENTGENOLOGICAL AND PATHOMORPHOLOGICAL CHANGES IN HEART OF DOGS SUBMITTED TO HYPOKINESIA FOR SIX MONTHS
I. G. Krasnykh, N. A. Gaydamakin, and V. G. Petrukhin *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) 25 Nov. 1985 p 54-59 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 41-46 (For primary document see N86-14848 05-51)
Avail: NTIS HC A07

The effect of 6-month hypokinesia on the cardiac function and pathomorphological changes in dogs was investigated. The heart size during systolic and diastolic contractions, stroke volume and contractile function were measured once a month using an X-ray unit and a kymograph. After the hypokinetic exposure six dogs were sacrificed and their hearts were examined morphologically and histochemically. The recovery processes were investigated on two other dogs that were allowed to survive for 30 days after exposure. The 6-month hypokinesia led to a significant decrease in the heart size, stroke volume, cardiac index and the contractile function. Morphological examinations revealed atrophic changes in the myocardium. Electron-microscopy investigations demonstrated focal destructive changes in myofibers and in mitochondria, some of them were dense while others had a more transparent matrix and degraded cristae. Histochemical data also suggest atrophic and destructive changes in the myocardium. E.A.K.

N86-14857# Joint Publications Research Service, Arlington, Va.
CHANGES IN PHYSICAL CONDITION, VESTIBULAR FUNCTION AND BONE SYSTEM OF RATS SUBMITTED TO LONG-TERM ROTATION
A. A. Shipov, V. N. Shvets, L. A. Tabakova, and O. Ye. Kabitskaya *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) 25 Nov. 1985 p 60-69 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 46-53 (For primary document see N86-14848 05-51)
Avail: NTIS HC A07

Unrestrained rats were rotated for 21 and 30 days at 1.1 and 2.0 G. The exposure did not deteriorate their equilibrium function or physical condition, however, the exposure decreased the reactivity and sensitivity of the semicircular canals. Bone parameters, longitudinal and transverse bone growth, metaepiphysis morphometry, indicated that the rats developed an acute stress reaction accompanied by an inhibited growth of limb bones during the first 7 days of rotation. By experimental day 30 the animals became adapted to the new environment. E.A.K.

N86-14858# Joint Publications Research Service, Arlington, Va.
CONTRACTILE PROPERTIES OF RAT MUSCLE FIBERS DURING LONG-TERM EXPOSURE TO +2 Gx ACCELERATIONS
V. S. Oganov, S. A. Shuratova, and M. A. Shirvinskaya *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) 25 Nov. 1985 p 70-74 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 53-56 (For primary document see N86-14848 05-51)
Avail: NTIS HC A07

The effect of 21-day exposure to +2 Gx and +1.1 Gx on the contractile properties of different muscle groups of rate fore- and hindlimbs was examined, using glycerinated myofibers in the ATP+Ca sq solution. It was found that the isometric contraction strength and velocity increased, the performance of the postural extensors also grew; that of the soleus m. in the +2 Gx rats and that of the triceps brachii m. in the +2 Gx and +1.1 Gx rats. The contractile changes of the flexors of fore- and hindlambs were insignificant and sometimes oppositely directed. The different responses of the muscles to acceleration were associated with the differences in their function, metabolism and biomechanics. E.A.K.

N86-14859# Joint Publications Research Service, Arlington, Va.
HEMODYNAMIC PARAMETERS AS RELATED TO DIFFERENT TOLERANCE TO HEAD-PELVIS ACCELERATIONS c52
N. I. Kokova *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) 25 Nov. 1985 p 75-80 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 56-60 (For primary document see N86-14848 05-51)
Avail: NTIS HC A07

Hemodynamic parameters in the subjects with various resistance to +Gz acceleration were investigated. The acceleration value was increased slowly. During centrifugation ECG, systolic pressure in the ear lobe, stroke volume and cardiac output were measured. In the resistant subjects stroke volume remained stable and cardiac output was close to or higher than the initial level. In the nonresistant subjects both parameters decreased although their heartrate was significantly higher than in the resistant subjects. Various visual disorders developed when cardiac output decreased by 50 to 70% as compared to the initial level. It is concluded that in the nonresistant peopel the compensatory mechanisms responsible for the stability of cardiac output include primarily HR increase, whereas in the resistant people they involve a high level of venous return and stroke volume. E.A.K.

N86-14860# Joint Publications Research Service, Arlington, Va.
CHANGES IN PHYSICOCHEMICAL PROPERTIES OF CONTRACTILE AND REGULATORY PROTEINS IN DIFFERENT TYPES OF MUSCLES DURING AND AFTER EXPOSURE TO ACCELERATIONS c52
B. A. Tikunov, M. A. Kayfadzhyan, and S. S. Oganesyan *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) 25 Nov. 1985 p 81-86 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 60-64 (For primary document see N86-14848 05-51)
Avail: NTIS HC A07

After 15-day exposure to +5 Gx the rate of superprecipitation, Mg2+-ATPase activity and actomyosin ATPase of slow muscles of white rats increased greatly. In actomyosin of fast muscles the exposure induced weaker and opposite changes in the superprecipitation rate and Mg+2-ATPase activity. The changes in actomyosin of the fast muscles were associated with shifts only in regulatory components while those of the slow muscle were produced by shifts in contractile proteins as well. This provided for a better recovery of the initial value of the superprecipitation rate and Mg+2-ATPase activity of actomyosin of the fast muscles a month after exposure. E.A.K.

N86-14861# Joint Publications Research Service, Arlington, Va.
CUMULATIVE EFFECT OF CORIOLIS ACCELERATIONS ON CORONARY HEMODYNAMICS **c52**
E. V. Lapayev and V. S. Bednenko *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) 25 Nov. 1985 p 87-92 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 64-68 (For primary document see N86-14848 05-51)
Avail: NTIS HC A07

Time-course variations in coronary circulation and cardiac output were measured in 29 healthy test subjects who performed tests with a continuous cumulation of Coriolis accelerations and in 12 healthy test subjects who were exposed to Coriolis accelerations combined with acute hypoxia. Adaptive changes in coronary circulation were seen. It is recommended to monitor coronary circulation during vestibulometric tests as part of medical examination of flying personnel. E.A.K.

N86-14862# Joint Publications Research Service, Arlington, Va.
NYSTAGMUS AS RELATED TO UTRICULAR FUNCTION **c52**
Yu. K. Stolbkov *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) 25 Nov. 1985 p 93-98 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 68-72 (For primary document see N86-14848 05-51)
Avail: NTIS HC A07

The horizontal neck nystagmus arising in response to angular acceleration as recorded electromyographically in pigeons. After bilateral section of the utricular nerves (Ramuli utriculi) the nygstagmic reactions to the right and to the left remained symmetrical although they were delayed when compared to the reactions of intact animals. Unilateral section of the utricular nerves caused asymmetric reactions from the semi-circular canals; the nystagmus toward the dissected nerve was delayed to a greater extent than that toward the intact nerve. E.A.K.

N86-14863# Joint Publications Research Service, Arlington, Va.
INDIVIDUAL DIFFERENCES IN MAXIMUM OXYGEN UPTAKE REGULATION AND LEVEL **c52**
V. S. Gorozhanin *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) 25 Nov. 1985 p 99-105 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 72-77 (For primary document see N86-14848 05-51)
Avail: NTIS HC A07

Neuronal and hormonal mechanisms responsible for the differences in the maximum oxygen consumption are discussed. The subjects with electroencephalographic and sensory signs of stimulating reticular-hypothalamic-amugdalic effects balanced with inhibitory cortical-striatic-septic-hippocampal-epiphyseal effects showed a high oxygen consumption, moderate excretion of epinephrine and norepinephrine, moderate plasma concentrations of ACTH, cortisol, total and free 11-OHCS and insulin, relatively high concentrations of STH, and specific dynamics of hormonal and metabolic reactions to aerobic effects. They included a moderate increase of the excretion of dopamine, DOPA and plasma concentrations of ACTH, a comparatively stable level of cortisol, total and free 11-OHCS, drastic increases of norepinephrine excretion and STH, lactate and pyruvate concentrations, a moderate decrease of insulin and pH levels. The subjects with high hypothalamic-reticular-amygdalic effects exhibited an opposite type of endocrine activity and time-course variations of hormonal-metabolic parameters, as well as low values of oxygen consumption. E.A.K.

N86-14864# Joint Publications Research Service, Arlington, Va.
SIGNIFICANCE OF VESTIBULAR RECRUITMENT AND DIRECTIONAL DOMINANCE OF NYSTAGMUS IN DIAGNOSTIC TESTS **c52**
M. M. Levashov *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) 25 Nov. 1985 p 106-111 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 78-81 (For primary document see N86-14848 05-51)
Avail: NTIS HC A07

Vestibular recruitment (VR), a phemonenon of impairment of vestibular nystagmus as a proportionate function of force of stimulus, is of diagnostic interest for the pathology of the ear. There is still no generally accepted opinion about the mechanisms of its onset, there is no uniformity of techniques for its detection and quantitative evaluation and terminology. The conceptions of mechanisms and potential relevance of this phenomenon to applied vestibulometry, which was developed on experience with nystagmometric investigations, is presented. E.A.K.

N86-14865# Joint Publications Research Service, Arlington, Va.
MINIATURE PIEZOELECTRIC TRANSDUCER WITH ELASTIC SHIELD FOR DYNAMIC STUDIES OF BIOLOGICAL OBJECTS **c35**
L. G. Simonov, G. A. Drobakhin, Yu. S. Ioffe, Yu. S. Safarov, and Ye. G. Talalayev *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) 25 Nov. 1985 p 112-115 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 81-82 (For primary document see N86-14848 05-51)
Avail: NTIS HC A07

In preparing for ultrasonic examination of biological objects, to provide reliable acoustic contact between the transducer and subject's body, the site of contact is irrigated with vaseline oil or other compound that produces acoustic contact and the sensor is held in the hand during the study. It is noted that the need to use liquid lubricants narrows the area of application of ultrasonic method, while manual immobilization of the transducer is acceptable only for brief studies related, for example, to evaluation of displacement or determination of geometric dimensions of different intratissular structures. The refinement of a piezoelectric transducer for dynamic tests and development of a nonliquid material to provide reliable acoustic contact between the transducer and biological object is discussed. Hemodynamic characteristics of the vascular system of the human brain in the course of long-term observation are evaluated. E.A.K.

N86-14866# Joint Publications Research Service, Arlington, Va.
VALIDATION OF RELIABILITY OF FIRE EXTINGUISHERS FOR MEDICAL PRESSURE CHAMBERS **c31**
G. Kh. Kharisov and N. F. Bubyr *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) 25 Nov. 1985 p 116-119 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 83-84 (For primary document see N86-14848 05-51)
Avail: NTIS HC A07

During a fire in a medical pressure chamber when operated in the regular mode it is impossible to evacuate people, and the only way to save human lives is by extinguishing the fire. The level of reliability of fire extinguishers intended for pressure chamber is examined. In case of fire, the life of people in the chamber depends entirely on reliability of operation of the fire extinguisher. The reliability of equipment, including fire extinguishers, depends on the cost. By regulating the reliability of its cost is also regulated. At the present time no standards are set for parameters of reliability of equipment which protects people from the hazards of a fire. E.A.K.

N86-14867# Joint Publications Research Service, Arlington, Va.
AGE-RELATED CHANGES IN ELECTROENCEPHALOGRAMS OF PILOTS **c52**
E. Marks, W. Zuzevic, E. Dworezki, and M. Mazenzki *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) 25 Nov. 1985 p 120-122 refs Transl. into ENGLISH from Kosmicheskaya

Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 85-86 (For primary document see N86-14848 05-51)
Avail: NTIS HC A07

An age related changes in electroencephalograms of pilots study was conducted in two stages. At the first stage a visual and statistical analysis of 343 EEG of 125 pilots; at the second, pilots of two age groups were screened: the average age of individuals in the first group was 24.7 years and in the 2d group, 43.8 years. Evoked potentials (EP) matched in response to photic stimuli was used. The average age at the start of EEG observation was 25.1 + or - 5.5 years and at the end, 43.6 + or - 4.6 years. Regularity of alpha rhythm on the EEG, mean frequency of basic rhythm, mean amplitude, reaction delay, activation of EEG by hyperventilation and light flashes (stroboscope) correlation between slow waves, frequency and amplitude of basic rhythm, correlation between EEG and clinical parameters are analyzed. A specially developed chart to analyze the EEG and the criteria of Student, Shapiro-Wilke and X2 in statistical processing are used. E.A.K.

N86-14868# Joint Publications Research Service, Arlington, Va.
DRUGS AND SURFACTANTS USED TO PREVENT CAISSON DISEASE IN RATS
V. V. Vlasov *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) 25 Nov. 1985 p 123-126 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 86-87 (For primary document see N86-14848 05-51)
Avail: NTIS HC A07

Changes in the blood-clotting system and vascular reactions have a substantial effect on rate of gas production, rate of escape of gas through the lungs, size of bubbles and their stability in development of decompression sickness. These reactions are an important factor that determines tolerance to decompression. By altering the body's reaction to the free gas phase that appears in tissues one can deliberately influence tolerance to decompression. Drugs medication capable of enhancing tolerance to decompression were investigated and the effects of some surfactants (SF) on the course of caisson disease are examined. E.A.K.

N86-14869# Joint Publications Research Service, Arlington, Va.
EFFECT OF 24,25-DIHYDROXYCHOLECALCIFEROL ON AMINO ACID METABOLISM OF HYPOKINETIC RATS
T. F. Vlasova, Ye. B. Miroshnikova, M. S. Belakovskiy, A. N. Kochetkova, and I. N. Sergeyev *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) 25 Nov. 1985 p 127-129 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 88-89 (For primary document see N86-14848 05-51)
Avail: NTIS HC A07

A 30-day restriction of motor activity of animals against the background of diets differing in calcium and phosphorus content led to decline of amino acid pool of blood, and excessive uptake of phosphorus aggravated the effect of hypokinesia. The effect of 24,25-dihydroxycholecalciferol--24,25(OH0 2D3 -- on amino acid metabolism of animals, are discussed and the use of this compound together with other agents for prevention and treatment of mineral metabolism under hypokinetic conditions is outlined. The possibility of normalizing amino acid metabolism under hypokinetic conditions with use of diets with a specific proportion of calcium and phosphorus and supplemental administration to animals of an active metabolite of vitamin D3--24,25(OH)2D3 is explored. E.A.K.

N86-14870# Joint Publications Research Service, Arlington, Va.
BIOCIDAL SYNTHETIC COATINGS BASED ON HIGH-MOLECULAR METALOORGANIC COMPOUNDS
V. F. Mishchenko, V. A. Zubov, and Yu. G. Yeremenko *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) 25 Nov. 1985 p 130-134 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 89-92 (For primary document see N86-14848 05-51)
Avail: NTIS HC A07

Long-term stays of man and animals in closed life-support systems lead to contamination of the room and objects in it by various microorganisms. Traditional sterilization methods was found to be either ineffective or extremely difficult and unsafe. Use of biologically active paint and varnish is an effective means of preventing development of microorganisms in closed life-support systems when they contain as biocidal supplements low-molecular organic compounds, organic derivatives of arsenic, mercury and copper. However, these materials are often highly toxic for man and animals. The low-molecular compounds used as biocidal additives in paint and varnish do not yield the desired result, since this biocidal agents usually do not have a broad spectrum of protective action. Due to constant exudation, the biocidal agents are utilized unwisely, which ultimately leads to reduction of efficacy and duration of protective action of the coating. E.A.K.

N86-14871# Joint Publications Research Service, Arlington, Va.
COMBINED EFFECTS OF STRESSORS ON THE LEVEL OF SPINAL REFLEX ARC STRUCTURES c52
F. I. Furduy, S. Kh. Khaydarliu, and L. M. Mamalyga *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) 25 Nov. 1985 p 135-140 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 92-95 (For primary document see N86-14848 05-51)
Avail: NTIS HC A07

Long-term restriction of motor activity alters appreciably the motor analyzer, including the spinal reflex arc which is the peripheral element of the central nervous system in effecting interaction between the body and environment. The initial period of hypokinesia differs appreciably from the subsequent period of adaptation and is associated in animals with the release reaction and occurs in the presence of a marked stress reaction leading to stressed function of the central nervous system and most other systems of the body. Hypoxia is the most frequent companion of hypokinesia, together with other extreme environmental factors. No data concerning the combined effects of various stressors on the level of the spinal reflex arc are available. The morphological and cytochemical changes in cellular structures of spinal cord ganglia (SCG) and motoneurons of the ventrolateral nucleus (VLN) of the spinal cord on the level of the lumbar and cervical spine under the separate and combined effect of stressors are studied. E.A.K.

52 AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and weightlessness.

N86-14872# David Sarnoff Research Center, Princeton, N.J.
PORTABLE DIAGNOSTIC RADIOMETER Final Report, 1 Oct. 1983 - 30 Jun. 1984
Jul. 1985 68 p
(Contract N00014-83-C-0524)
(AD-A157685) Avail: NTIS HC A04/MF A01 CSCL 06/5

There exists a need for a portable diagnostic instrument that can noninvasively monitor and display internal body temperatures. This instrument would be extremely important on U.S. Navy ships whose complement does not include the services of competent medical professionals. In this case it would be important to determine whether a particular medical emergency does or does not exist in a patient. This would determine whether the patient should or should not be evacuated to a suitable medical facility for treatment. The instrument would determine, by radiometric means, whether particular organs exhibit an elevated temperature. For example, this may be an aid in the diagnosis of appendicitis or nephritis. The instrument described in this report is a dual-

frequency microwave radiometer. The radiometer measures the amount of noise power being radiated from a localized tissue volume on the patient. The amplitude of this noise power over a frequency spectrum determined by the microwave components is proportional to the average temperature of the volume in question. Making this measurement at two separate frequencies can give an indication of the temperature profile over a depth as great as 6 cm. Author (GRA)

N86-14873# Wisconsin Univ., Madison.
PULMONARY ADAPTATION TO HIGH ALTITUDE Semiannual Progress Report, Dec. 1984 - Jun. 1985
J. A. Dempsey Jun. 1985 8 p
(Contracts DAMD17-82-C-2259; DAMD17-77-C-7006)
(AD-A157694) Avail: NTIS HC A02/MF A01 CSCL 06/19

Three major aims of the contract were addressed in the past 6 months: (1) We completed our study of the relationship between hypoxia-induced periodic breathing in sleep and the occurrence of obstructive apnea. (2) The question of respiratory muscle fatigue during exercise in humans was studied in highly fit subjects performing high intensity exercise to exhaustion. (3) We have studied respiratory muscle recruitment during exercise and saw evidence of active expiration even in mild exercise. GRA

N86-14874# National Council on Radiation Protection and Measurements, Bethesda, Md.
STUDIES CONCERNED WITH BASIC RADIATION PROTECTION CRITERIA AND STUDIES CONCERNED WITH GUIDANCE AND INFORMATION
24 Jul. 1985 6 p
(Contract N00014-84-C-0776)
(AD-A158319) Avail: NTIS HC A02/MF A01 CSCL 06/18

Scientific Committee 1 is a standing committee of the NCRP charged with the formulation of basic radiation protection criteria. The Committee is actively engaged in the development of a radiation protection system based on risk. The average annual risk of mortality associated with employment in safe industries is being used by the Committee as the guideline for developing recommendations for the maximum annual risk of mortality for occupational radition exposure. Levels of risk associated with external whole body exposure, partial body exposure, internal exposure and the methodology for the summation of these risks are also being addressed by the Committee. The Committee plans to draft four reports over the next few years. These will cover: (1) exposure limits, (2) the philosophical basis of a radiation protection system based on risk, (3) site-specific risk coefficients, and (4) implementation of a radiation protection system based on risk. The report on exposure limits, Recommendations On Exposure Limits, will enter the Council's review process during the summer of 1985. GRA

N86-14875# Army Research Inst. of Environmental Medicine, Natick, Mass.
CIRCULATORY AND THERMOREGULATORY ACTIONS OF HYDRATION DURING EXERCISE-HEAT STRESS
M. N. Sawka, R. P. Francesconi, and K. B. Pandolf Aug. 1985 14 p
(DA Proj. 3E1-62777-A-879)
(AD-A158440; USARIEM-M36/85) Avail: NTIS HC A02/MF A01 CSCL 06/19

During exercise in the heat, sweat output often exceeds water intake resulting in hypohydration. Hypohydration during exercise causes a greater heat storage and reduces endurance in comparison with euhydration levels. The greater heat storage is attributed to a decreased sweating rate as well as decreased cutaneous blood flow. These response decrements are attributed to both plasma hyperosmolality and plasma hypovolemia. In addition, plasma hypovolemia will result in a reduced cardiac output response, relative to euhydration, during exercise-heat stress. Hyperhydration, or body fluid excess, only provides the advantage of delaying the onset of hypohydration. Author (GRA)

N86-14876# School of Aerospace Medicine, Brooks AFB, Tex.
FOODBORNE AND WATERBORNE DISEASE OUTBREAKS. A COMPILATION AND SUBJECTIVE PROFILE Final Report, Jan. 1977 - Jun. 1983
T. V. Murphy Jul. 1985 26 p
(AD-A158536; USAFSAM-TR-85-28) Avail: NTIS HC A03/MF A01 CSCL 06/5

This papar provides the epidemiologic field with a single source of information about many confirmed foodborne and waterborne disease outbreaks for each of five common bacterial etiologies: Staphylococcus aureus, Salmonella, Shigella, Clostridium perfringens, and Vibrio parahaemolyticus. The paper also evaluate traditional methods of outbreak reporting and suggest that an investigator might apply information of past outbreaks to help form an initial, presumptive diagnosis of a most probable etiologic agent in a current outbreak. GRA

N86-14877# Borriston Research Labs, Inc. Temple Hills, Md.
DEVELOPMENT OF VACCINES TO THE MYCOTOXIN T-2 Final Report, 16 May 1983 - 15 Feb. 1985
V. Manohar 15 Mar. 1985 16 p
(Contract N00014-83-C-0441)
(AD-A158544; FR-1) Avail: NTIS HC A02/MF A01 CSCL 06/5

An ELIAS System to detect and titer antibody to Mycotoxin T-2 was standardized. A new rapid simple method of making T-2 hemisuccinate (T-2-HS) was developed. The merit of the new method over the existing one accounts for its simple, less time-consuming procedure, which can be carried out at room temperature, with as high a yield of 66%. T-2-HS so developed was conjugated to derivatised sepharope-4B beads to make a column to affinity purify the antibody to Mycotoxin T-2. Polyclonal antisera to T-2 toxin was produced by immunizing rats and mice with T-2-HS coupled to KLH, goat antimouse IgG and monoclonal antimouse IgD. Affinity purified antibody to T-2 was employed in immunizing mice for the development of anti-idiotypic antibodies. Initially syngeneic immunization were carried out in Balb/c mice. Protective role anti-T-2 antibodies upon passive transfer, was examined. Both monoclonal and polyclonal antibodies to T-2, were found to neutralize T-2 toxin in vitro. Upon passive transfer to skin intradermally, inhibition of skin necrotization effect due to T-2 toxin was demonstrated, suggesting, role of an effective antidote. Protective immunity to in vivo exposure to T-2 toxin, upon active immunization with T-2-HS was also examined. Skin necrotization effect of T-2 toxin was completely inhibited in immune rats. However, the in vivo effect of Oral T-2 toxin, as measured by leucopenia in actively immunized rats, was not dramatically significant. GRA

N86-14878# Washington Univ., St. Louis, Mo. Dept. of Electrical Engineering.
CELLULAR EFFECTS OF ELECTROMAGNETIC RADIATION Final Technical Report, 1 Feb. - 31 Jul. 1985
W. F. Pickard 16 Aug. 1985 11 p
(Contract N00014-82-K-0261)
(AD-A158547) Avail: NTIS HC A02/MF A01 CSCL 06/18

Giant cells of characean algae were examined for electrophysiological sequelae to acute electromagnetic field irradiation at 10 mW/per sq cm. Carrier frequencies ranged from 50 MHz to 12.4 GHz and a variety of modulation protocols were employed. No effects were detected at this power level. GRA

N86-14879# Naval Health Research Center, San Diego, Calif.
BENZODIAZEPINE ACTIVITY: DAYTIME EFFECTS AND THE SLEEP EEG Interim Report, Sep. 1978 - Jun. 1984
L. C. Johnson and C. L. Spinweber 22 Aug. 1984 19 p
(AD-A158702; NAVHLTHRSCHC-84-33) Avail: NTIS HC A02/MF A01 CSCL 06/15

In this paper we review the effects of benzodiazepine hypnotics on the structure of sleep, arousal threshold during sleep, and the impact of bedtime hypnotic use on next-day performance. We also describe the effects of discontinuation of use of long and short half-life sedative-hypnotics. Results indicate that the half-life of benzodiazepine hypnotics is not the best predictor of next-day

performance effects, arousal threshold effects, or the nature of EEG changes during sleep. Other pharmacokinetic properties, such as volume of distribution, must also be considered. Long and short half-life benzodiazepines both may produce a rebound insomnia, although the time of occurrence seems to differ. The marked individual differences in response to similiar drug plasma levels plus processes of tolerance and adaptation limit the probability that significant correlations during chronic use. Dose level is the best predictor of next-day effects, and so, the smallest effective dose should be described. GRA

N86-14880# Behavioral Research Associates, West Lafayette, Ind.,
BIOCYBERNETIC ANALYSIS OF A HYBRID WORKLOAD MODEL Final Report, 30 Sep. 1984 - 30 Mar. 1985 on Phase 1
B. H. Kantowitz May 1985 40 p
(Contract F49620-84-C-0116)
(AD-A159033; BRA-85-10; AFOSR-85-0661TR) Avail: NTIS HC A03/MF A01 CSCL 05/10

Biocybernetic measures - heart rate inter-beat interval (IBI) and event-related brain potential (ERP) - were used to provide converging operations to refine a hybrid model of attention and workload. Two experiments using the psychological refractory period paradigm were conducted with stimulus-response uncertainty and inter-stimulus interval (ISI) as manipulations of workload. Reaction time was influenced by uncertainty and ISI; IBI standard deviation and spectral data were influenced by uncertainty; preliminary analysis of ERP showed N200 amplitude to be influenced by uncertainty and ISI. These results were related to a hybrid processing model formulated by Kantowitz and Knight (1976). GRA

N86-14881# Letterman Army Inst. of Research, San Francisco, Calif.
A MULTI-ISOTOPE PROCEDURE FOR SIMULTANEOUSLY ESTIMATING THE VOLUME OF BODY FLUID COMPARTMENTS OF SWINE Report, for Jan. 1983 - May 1985
C. A. Bossone and J. P. Hannon Jun. 1985 64 p
(DA Proj. 3M1-61102-BS-10)
(AD-A159631; LAIR-201) Avail: NTIS HC A04/MF A01 CSCL 06/16

The purpose of the studies reported in this paper was to develop isotope-based procedures to measure plasma volume, red cell volume, extracellular fluid volume, and total body water individually. Subsequently, techniques would be developed to use a combination of these procedures to measure some or all of the fluid spaces in the pig simulaneously. A procedure was developed for simultaneously estimating the volume of all major body fluid compartments. Splenectomized pigs, 20 to 25 kg, with chronically-implanted carotid artery catheters, received a bolus injection (per kg) (1 uCi 125 I-albumin, 11.7 uCi 51Cr-EDTA, 0.6 uCi 22Na, and 5.3 uCi 3H2O) followed by a 5.2 uCi ml/kg injection of 51 Cr-tagged red cells. Estimated lean body mass averaged 822 g/kg and body fat, 178 g/kg. The new procedure was rapid, technically simple, required small amounts of blood and was applicable to conscious animals. GRA

N86-14882# Oak Ridge National Lab., Tenn.
NEUTRON EFFECTS IN HUMANS: PROTECTION CONSIDERATIONS
R. J.M. Fry 1985 18 p refs Presented at the Workshop on Neutron Therapy: Low Dose Rate and Beam Radiation Therapy, Lexington, Ky., 24 Apr. 1985
(Contract DE-AC05-84OR-21400)
(DE85-015047; CONF-850453-2) Avail: NTIS HC A02/MF A01

Committee I of the International Commission on Radiological Protection has recommended that the Quality Factor for neutrons should be changed from 10 to 20. This article is an interesting recount of the tale of Q from the viewpoint of an observer which illustrates many of the problems that the selection of protection standards pose. DOE

N86-14883# Lawrence Livermore National Lab., Calif.
VARIATION IN BASELINE SISTER CHROMATID EXCHANGE FREQUENCIES IN HUMANS
A. V. Carrano, L. K. Ashworth, J. L. Minkler, and D. H. Moore, II 18 Jun. 1985 7 p refs Presented at the 4th International Conference on Environmental Mutagens, Stockholm, 24 Jun. 1985
(Contract W-7405-eng-48)
(DE85-016084; UCRL-92836; CONF-8506137-9) Avail: NTIS HC A02/MF A01

The lymphocyte is a surrogate cell that is routinely used to measure sister chromatid exchange (SCE) frequencies in humans. Our interests have focused on identifying sources of variability in human lymphocyte SCE frequencies, quantifying the magnitude of the variation, and understanding how it might affect the interpretation of data from mutagen-exposed groups. We have measured lymphocyte SCE frequencies in more than 900 blood samples from over 500 individuals. DOE

N86-14884# Fondazione Ugo Bordoni, Rome (Italy).
REDUCTION OF SUBJECTIVE REDUNDANCY IN IMAGE SIGNALS: RESULTS OBTAINED AND RESEARCH TRENDS [RIDUZIONE DI RIDONDANZA SOGGETTIVA NEI SEGNALI DI IMMAGINE: RISULTATI OTTENUTI A LINEAMENTI DI RICERCA FUTURA]
Guido DiBlasio Dec. 1984 35 p refs In ITALIAN
(FUB-24-1984) Avail: NTIS HC A03/MF A01

The structure and the functions of the human visual system are studied in order to improve the compression of image signals without significative quality loss. A rate of up to 100 is considered the long range goal. Filtering structures defined as hypercomplexes are described. These structures give position estimation and velocity vectors of image elements. A model of image contour perception is presented. Other models describing other functions of the visual system are proposed to implement a research program. Author (ESA)

N86-14885# Joint Publications Research Service, Arlington, Va.
USSR REPORT: LIFE SCIENCES. BIOMEDICAL AND BEHAVIORAL SCIENCES Abstracts Only
22 Oct. 1985 82 p Transl. into ENGLISH from various Russian articles
(JPRS-UBB-85-024) Avail: NTIS HC A05/MF A01

U.S.S.R. progress in the biomedical and behavioral sciences is reported. Topics discussed include: aerospace medicine, Agrotechnology; biochemistry; biophysics; biotechnology; ecology; food technology; genetics; human factors; immunology; laser effects; marine mammals; microbiology; general medicine; military medicine; pharmacology and toxicology; physiology; public health; radiation biology and psychology. For individual titles, see N86-14886 through N86-14887.

N86-14886# Joint Publications Research Service, Arlington, Va.
VOICE ANALYZER FOR EVALUATING PILOT'S CONDITION Abstract Only
S. Dvigantsev *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-85-024) 22 Oct. 1985 p 30 Transl. into ENGLISH from Gudok (Moscow), 15 Aug. 1985 p 4
(For primary document see N86-14885 05-52)
Avail: NTIS HC A05/MF A01

This article reports on the development of a system called Equipment for Distinguishing Speech-Signal Parameters (SVPRS). The system is intended for monitoring the condition of airplane crews in the course of long flights through voice analysis from radio conversations. The system is capable of evaluating a subject's emotional state on the basis of a single spoken word, it is claimed. The system is being developed by the department of aviation medicine of the State Scientific Research Institute of Civil Aviation, with assistance from the USSR Academy of Sciences' Institute of Higher Nervous Activity and Neurophysiology, and, also, cyberneticists of Leningrad. The system consists of a magnetic memory, audio-signal filters, a frequency analyzer, a minicomputer, and instruments for processing recordings of speech and for

input of data into the computer. Work on perfecting the system is said to be continuing. B.W.

N86-14887# Joint Publications Research Service, Arlington, Va.
ALCOHOL EFFECTS ON BRAIN Abstract Only
M. Ignatenko *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-85-024) 22 Oct. 1985 p 54-55 Transl. into ENGLISH from Pravda (Moscow), 19 Aug. 1985 p 7 (For primary document see N86-14885 05-52)
Avail: NTIS HC A05/MF A01

The article reports on a physiological adaptation experiment which was being conducted in the Kara-Kumy Desert. A group of 12 subjects was taking part in the experiment. The group consisted of six Ashkhabad residents and six Moscow residents. For the first time, residents of Central Asia who are acclimatized to high temperatures were taking part in such an experiment simultaneously with residents of the central Russian republic who are not accustomed to desert conditions. The Russian and Asian groups' adaptability to desert conditions was compared. This program was aimed at gaining detailed knowledge of processes which take place in the body from the effect of stress conditions. B.W.

N86-14849# Joint Publications Research Service, Arlington, Va.
HYGENIC ASPECTS OF REGULAR DIET OF FLIGHT PERSONNEL
I. G. Popov *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) 25 Nov. 1985 p 1-21 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 4-19 (For primary document see N86-14848 05-51)
Avail: NTIS HC A07

N86-14850# Joint Publications Research Service, Arlington, Va.
METABOLIC DISTINCTIONS OF HUMAN RED BLOOD DURING LONG-TERM SPACEFLIGHTS
A. S. Ushakov, S. M. Ivanova, F. I. Ataullakhanov, A. V. Pichugin, Ye. I. Dubinskaya, S. S. Brantova, O. I. Labetskaya, V. P. Naydina, and A. Ye. Zezerov *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) 25 Nov. 1985 p 22-26 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 19-23 (For primary document see N86-14848 05-51)
Avail: NTIS HC A07

N86-14851# Joint Publications Research Service, Arlington, Va.
HUMAN BODY BIOMECHANICS AND MOVEMENTS AFTER 120-DAY ANTIORTHOSTATIC HYPOKINESIA
V. M. Zatsiorskiy, M. G. Sirota, B. I. Prilutskiy, L. M. Raytsin, V. N. Seluyanov, and L. G. Chugunova *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) 25 Nov. 1985 p 27-32 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 23-27 (For primary document see N86-14848 05-51)
Avail: NTIS HC A07

N86-14852# Joint Publications Research Service, Arlington, Va.
FUNCTIONAL ACTIVITY OF HUMAN SEROTONINERGIC AND HISTAMINERGIC SYSTEMS DURING LONG-TERM ANTIORTHOSTATIC HYPOKINESIA
N. A. Davydova, Ye. Yu. Galkina, and A. S. Ushakov *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) 25 Nov. 1985 p 33-37 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 27-30 (For primary document see N86-14848 05-51)
Avail: NTIS HC A07

N86-14853# Joint Publications Research Service, Arlington, Va.
BODY POSITION DURING HYPOKINESIA, AND FLUID-ELECTROLYTE METABOLISM
V. B. Noskov, G. I. Kozyrevskaya, B. V. Morukov, Ye. M. Artamasova, and L. A. Rustamyan *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) 25 Nov. 1985 p 38-43 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 31-34 (For primary document see N86-14848 05-51)
Avail: NTIS HC A07

N86-14854# Joint Publications Research Service, Arlington, Va.
MICROCIRCULATION AND CELLULAR HEMOSTASIS IN MEN WITH BORDERLINE ARTERIAL HYPERTENSION SUBMITTED TO NEUTRAL-TEMPERATURE DRY IMMERSION IN WATER
L. L. Kirichenko, V. V. Smirnov, and A. G. Yevdokimov *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) 25 Nov. 1985 p 44-49 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 35-38 (For primary document see N86-14848 05-51)
Avail: NTIS HC A07

N86-14855# Joint Publications Research Service, Arlington, Va.
EFFECT OF POSITIVE PRESSURE BREATHING ON HEMODYNAMICS IN PATIENTS WITH BORDERLINE HYPERTENSION SUBMITTED TO WATER IMMERSION
V. N. Orlov, I. O. Fomin, A. E. Radzevich, and G. S. Leskin *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) 25 Nov. 1985 p 50-53 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 39-41 (For primary document see N86-14848 05-51)
Avail: NTIS HC A07

N86-14859# Joint Publications Research Service, Arlington, Va.
HEMODYNAMIC PARAMETERS AS RELATED TO DIFFERENT TOLERANCE TO HEAD-PELVIS ACCELERATIONS
N. I. Kokova *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) 25 Nov. 1985 p 75-80 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 56-60 (For primary document see N86-14848 05-51)
Avail: NTIS HC A07

N86-14860# Joint Publications Research Service, Arlington, Va.
CHANGES IN PHYSICOCHEMICAL PROPERTIES OF CONTRACTILE AND REGULATORY PROTEINS IN DIFFERENT TYPES OF MUSCLES DURING AND AFTER EXPOSURE TO ACCELERATIONS
B. A. Tikunov, M. A. Kayfadzhyan, and S. S. Oganesyan *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) 25 Nov. 1985 p 81-86 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 60-64 (For primary document see N86-14848 05-51)
Avail: NTIS HC A07

N86-14861# Joint Publications Research Service, Arlington, Va.
CUMULATIVE EFFECT OF CORIOLIS ACCELERATIONS ON CORONARY HEMODYNAMICS
E. V. Lapayev and V. S. Bednenko *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) 25 Nov. 1985 p 87-92 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 64-68 (For primary document see N86-14848 05-51)
Avail: NTIS HC A07

N86-14862# Joint Publications Research Service, Arlington, Va.
NYSTAGMUS AS RELATED TO UTRICULAR FUNCTION
Yu. K. Stolbkov *In its* USSR Report: Space Biology and Aerospace

Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) 25 Nov. 1985 p 93-98 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 68-72 (For primary document see N86-14848 05-51)
Avail: NTIS HC A07

N86-14863# Joint Publications Research Service, Arlington, Va.
INDIVIDUAL DIFFERENCES IN MAXIMUM OXYGEN UPTAKE REGULATION AND LEVEL
V. S. Gorozhanin *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) 25 Nov. 1985 p 99-105 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 72-77 (For primary document see N86-14848 05-51)
Avail: NTIS HC A07

N86-14864# Joint Publications Research Service, Arlington, Va.
SIGNIFICANCE OF VESTIBULAR RECRUITMENT AND DIRECTIONAL DOMINANCE OF NYSTAGMUS IN DIAGNOSTIC TESTS
M. M. Levashov *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) 25 Nov. 1985 p 106-111 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 78-81 (For primary document see N86-14848 05-51)
Avail: NTIS HC A07

N86-14867# Joint Publications Research Service, Arlington, Va.
AGE-RELATED CHANGES IN ELECTROENCEPHALOGRAMS OF PILOTS
E. Marks, W. Zuzevic, E. Dworezki, and M. Mazenzki *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) 25 Nov. 1985 p 120-122 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 85-86 (For primary document see N86-14848 05-51)
Avail: NTIS HC A07

N86-14871# Joint Publications Research Service, Arlington, Va.
COMBINED EFFECTS OF STRESSORS ON THE LEVEL OF SPINAL REFLEX ARC STRUCTURES
F. I. Furduy, S. Kh. Khaydarliu, and L. M. Mamalyga *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) 25 Nov. 1985 p 135-140 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 92-95 (For primary document see N86-14848 05-51)
Avail: NTIS HC A07

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N86-14888# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Psychology.
SKILL ACQUISITION: COMPILATION OF WEAK-METHOD PROBLEM SOLUTIONS Interim Report, Aug. 1984 - Aug. 1985
J. R. Anderson 12 Aug. 1985 75 p
(Contract N00014-84-K-0064)
(AD-A158725; TR-85-1-ONR) Avail: NTIS HC A04/MF A01 CSCL 05/10

Cognitive skills are encoded by a set of productions, which are organized according to a hierarchical goal structure. People solve problems in new domains by applying weak problem-solving procedures to declarative knowledge they have about this domain. From these initial problem solutions, production rules are compiled which are specific to that domain and that use of the knowledge. Numerous experimental results follow from this conception of skill organization and skill acquisition. These experiments include predictions about transfer among skills, differential improvement on problem types, effects of working memory limitations, and applications to instruction. The theory implies that all variety of skill acquisition, including that typically regarded as inductive, conforms to this characterization. GRA

N86-14889# Old Dominion Univ., Norfolk, Va. Dept. of Psychology.
ASSESSMENT OF VISUOSPATIAL ABILITIES USING COMPLEX COGNITIVE TASKS Final Report, 1 Jun. 1983 - 1 Apr. 1984
G. L. Allen Nov. 1984 36 p
(Grant AF-AFOSR-0161-83)
(AD-A158919; AFOSR-85-0665TR) Avail: NTIS HC A03/MF A01 CSCL 05/10

Two studies were conducted in separate areas concerned with visuospatial abilities. The first study was designed to examine the effects of type of instruction (verbal versus graphic) and sex of subject on the acquisition of procedural knowledge in a spatial task. The spatial task employed was a computerized maze learning task, with trials to criterion and errors to criterion serving as dependent variables. Results indicated that graphic instructions led to fewer errors and trials to criterion than did verbal instructions. However, the performance of males was not superior to that of females, and the hypothesized interaction involving type of instruction and sex of subject was not found. Correlations between psychometric measures of cognitive abilities and measures of maze learning were easily interpreted for learning under graphic instructions but were difficult to interpret for learning under verbal instructions. These findings suggested the need for additional research focusing on: (1) replicating the current results, (2) delineating the factors underlying individuals' learning effectiveness under different types of instructions, and (3) examining individuals' awareness of the relationship between learning effectiveness and type of instruction in visuospatial tasks. The second study was designed to determine the relationship between performance on traditional paper-and-pencil tests of spatial abilities and performance on a task required macrospatial cognitive skills. GRA

N86-14890# SRI International Corp., Menlo Park, Calif. Life Sciences Div.
NEUROPHYSIOLOGICAL BASES OF EVENT-RELATED POTENTIALS Annual Report, 1 May 1984 - 30 Apr. 1985
C. S. Rebert Jun. 1985 64 p Original contains color illustrations
(Contract F49620-82-K-0016)
(AD-A158997; AFOSR-85-0575TR; AR-3) Avail: NTIS HC A04/MF A01 CSCL 06/16

In order to more fully understand the physiological and psychological significance of event-related potentials, cortical and subcortical recordings are being obtained from monkeys performing in operant-conditioning tasks. Five cynomolgus monkeys were successfully trained in the cued-reaction time task at SRI International and recordings were obtained in several experimental conditions--tone discrimination, variation of interstimulus interval (ISI) and stimulus proportionality, and administration of atropine. Under some conditions stimulus salience was enhanced, as evidenced by enlarged evoked potentials, when the ISI and stimulus proportionality were altered. The effects of the anticholinergic drug atropine could be attributed to its peripheral effects. Preliminary examination of dynamic intracerebral interactions in one monkey was carried out in collaboration with A. Gevins at the EEG Systems Laboratory, and studies of two monkeys were continued at Stanford in order to study the P300 wave. Five female stump-tailed macaque monkeys were purchased, trained, and implanted and are ready for tone-light pairing and recording. GRA

N86-14891# Vreuls Research Corp., Thousand Oaks, Calif.
PERFORMANCE MEASUREMENT GUIDELINES FOR

RESEARCH Final Report 15 Mar. 1980 - 30 Sep. 1982
D. Vreuls, R. W. Obermayer, A. L. Wooldridge, and M. J. Kelly
13 Jun. 1985 201 p
(Contract F49620-80-C-0058)
(AD-A159055; AFOSR-85-0642TR) Avail: NTIS HC A10/MF A01 CSCL 05/9

All three military services are developing automated human performance measurement systems fore aviation training devices and research on human performance. The purpose of this study was to create a set of aircrew-system performance measurement guidelines for research based on a review of current practice, and the measurement experience and technical judgement of the investigators. A subjective analysis of common measurement requirements among flight tasks for all phases of military aviation was conducted. The selection of system state variables would be dictated by the individual research problem, but guidelines for sampling, measure segmentation, and selection of transforms to create measurement were developed for common flight tasks and measurement problems. Performance measurement issues in system design, training, and automated performance measurement system design were discussed. FORTRAN program listings for common transforms and specialized multivariate data analyses for selecting and constructing measurement from empirical data were appended. Use of the illustrated techniques was recommended, as was the need to update these techniques as measurement experience accrues. GRA

N86-14892# School of Aerospace Medicine, Brooks AFB, Tex.
SYLLOGISTIC REASONING TASKS, A METHODOLOGICAL REVIEW Final Report, Jun. - Aug. 1983
A. Narvaez and J. C. Miller Jul. 1985 33 p
(AF Proj. 2312)
(AD-A159190; USAFSAM-TR-84-41) Avail: NTIS HC A03/MF A01 CSCL 05/10

The syllogism is a system of reasoning that has been both used and investigated in psychology. The syllogism has many components and defining characteristics. Four basic models of form representation (spatial, linguistic, mixed, and algorithmic) used for linear syllogisms are briefly described. Debate concerning the processes that subjects use in solving syllogisms has led to the formulation of process models. It proposed model for linear syllogisms provides a way to break down the stages of syllogistic problem solving in order to predict performance. Many factors have been shown to affect or influence subjects' performance in syllogistic reasoning. Two historical hypotheses concerning sources of error are the atmosphere, or global impression, of the syllogism--and the conversion hypothesis--which emphasizes illicit processes subjects use in solving syllogisms. Other sources of error include figure effects (syllogisms in certain figures are more difficult than others) and personal bias (one's personal beliefs and attitudes influence performance on syllogisms that are emotion laden or of a controversial nature). Formal rules with which to test the validity of categorical syllogisms are proposed as guidelines for syllogism task construction, and suggestions for experimental design are presented. GRA

N86-14893# Colorado Univ., Boulder. Center for Research on Judgment and Policy.
MOMENT BY MOMENT VARIATION IN THE COGNITIVE ACTIVITY OF EXPERTS
R. M. Hamm Aug. 1985 91 p
(Contract N00014-81-C-0591)
(AD-A159466; AD-E440296; CRJP-257) Avail: NTIS HC A05/MF A01 CSCL 05/10

This paper reports the analysis of moment by moment variation in the use of intuitive and analytical cognition by experts engaged in a complex judgement task. Six highway engineers were asked to think aloud while producing formulas that expressed their knowledge of how highway aesthetics, safety, and capacity are determined by sets of relevant factors. Each engineer's statements were measured with multiple indices of the use of intuitive or analytical cognition, thus producing a moment by moment measure of the engineer's cognitive activity. Measures reflecting the rate of alternation between intuition and analysis, as well as linear and nonlinear trends, were derived from this. Differences in these measures due to task topic were found. Two predictions from Cognitive Continuum Theory were supported by the data: (a) the average segment was more analytical on the capacity task than on the aesthetics task, and (b) the rate of alteration between analysis and intuition was faster on the capacity task, which has high standards, than on the aesthetics task. The subtask the engineer was engaged in was also measured over time, and its was found that subjects used different modes of cognitive activity on different subtasks. Finally, it was discovered that the proportion of time the engineer spent doing particular cognitive activities and particular subtasks was related to the production of more accurate formulas. GRA

N86-14894# Army Research Inst. for the Behavioral and Social Sciences, Alexandria, Va.
AN INVESTIGATION OF JUDGMENTS OF CATEGORY FREQUENCY Technical Report, Jul. 1982 - Jun. 1983
J. A. Englert Oct. 1984 47 p
(DA Proj. 2Q2-62722-A-791)
(AD-A159555; ARI-TR-653) Avail: NTIS HC A03/MF A01 CSCL 05/10

Two experiments investigated the kinds of frequency information that people can remember and individual differences in accuracy of reporting frequency. The task involved presenting individual instances of natural categories and requiring subjects to give absolute estimated of the number of times each category had occurred. In the first experiment, the variability of items was manipulated to assess whether subjects base their estimates on a direct memory access or on a retrieval and mental count of individual instances. A second experiment evaluated subject's capability to report category frequency at two levels of conceptual organization and whether the accuracy of either type of judgement was related to learning style. Data from both experiments suggested that frequency is encoded directly with the memory representation for the concept. The second experiment revealed a sensitivity for frequency of both higher and lower categories, although the former were substantially underestimated. Learning style was not related to either frequency judgement task. The observed underestimation of high frequencies implies a need to take this fundamental judgement bias into account when training persons to make frequency judgements as part of analytical tasks such as risk assessment. GRA

N86-14895# National Aerospace Lab., Amsterdam (Netherlands). Flight Div.
THEORETICAL AND EXPERIMENTAL ANALYSIS OF PILOT FAILURE DETECTION BEHAVIOR DURING VARIOUS AUTOMATIC APPROACH CONDITIONS
R. C. vandeGraaff and P. H. Wewerink 29 Apr. 1983 15 p refs Presented at 19th Ann. Conf. on Manual Control, Cambridge, Mass., 23-25 May 1983
(Contract NIVR-1857)
(NLR-MP-83025-U; B8566436) Avail: NTIS HC A02/MF A01

Pilots' failure detection performance was investigated in a moving-base flight simulator. The task considered was the monitoring of stabilized automatic approaches. Abnormal conditions (excessive wind shears or system failures) were to be detected on the basis of unacceptable deviations of displayed variables from their normal positions. Four experienced airline pilots participated in the experiment. The independent variables were: failure type (wind shear or system failure), the axis in which the failure occurred (longitudinal or lateral), and the prior probability of failure occurrence (0.2 to 0.8). The dependent variables were detection times and display deviations at the moment of detection. A theoretical analysis based on a model of the human observer and decision maker formulated in terms of linear estimation and classical sequential decision theory was carried out. Model and measurements agree well, although for two subjects failure detection times are larger. Results show that wind shears are detected more slowly than system failures. Author (ESA)

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N86-14896# Argonne National Lab., Ill. Computing Services.
THE SCIENTIFIC WORKSTATION EVALUATION PROJECT: MULTIDISCIPLINARY EXPERIENCE WITH A SCIENTIFIC WORKSTATION
Richard C. Raffenetti, Goran Birgersson, Roger N. Blomquist, James M. Kennedy, Dale D. Koelling, Anthony J. Policastro, and Clifford M. Caruthers, ed. 10 Dec. 1985 97 p refs
(Contract W-31-109-eng-38)
(ANL-84-100) Avail: NTIS HC A05/MF A01

The objective of this project has been to evaluate a scientific workstation. A workstation is a dedicated computing system that supplies a fixed quantity of computing resource for its user. A workstation's interactive response and its total throughput are limited by the speeds of various components of the workstation hardware and the operating system software. A forerunner of the scientific workstation is the so-called personal desktop computer, itself a kind of workstation. The architecture of the processors used in personal desktop computers cannot meet the needs of heavy-duty scientific computing work. Semiconductor companies are now striving to implement a generation of 32-bit microprocessors and related circuitry. Out of these efforts have appeared the complete computer systems which are capable of scientific computing. Members of the technical staff were invited to help define minimum configuration and minimum workstation capabilities. After the machine was selected and delivered, it was integrated into the Argonne computing environment. Following this integration, for five months of the six month evaluation period, user evaluators had an opportunity to use the workstation to do their scientific computing. Observations and conclusions are discussed in detail. B.W.

N86-14897# Army Research Inst. for the Behavioral and Social Sciences, Alexandria, Va.
HUMAN FACTORS ENGINEERING DESIGN CRITERIA FOR FUTURE SYSTEMS. DESIGN CRITERIA EVOLVING FROM THE FIRE SUPPORT TEAM VEHICLE (FIST-V) OPERATIONAL TEST 2 Research Report, for Period Ending Jan. 1984
L. M. Crumley and W. K. Earl Jan. 1985 26 p
(DA Proj. 2Q2-63739-A-793)
(AD-A158312; ARI-RP-85-04; R-2) Avail: NTIS HC A03/MF A01 CSCL 19/3

Human factors engineering (HFE) design problems reported in the FIST-5 Operational Test 2 were compared with criteria in MIL-STD-1472C and MIL-HDBK-759A to determine criteria adequacy. Where problems occurred and the related current criteria were adequate, it is recommended that greater emphasis be given these criteria in future programs. New criteria are proposed for inadequate or missing criteria. HFE problems were distributed across 27 different equipment components. Current criteria were judged adequate for 25 features and inadequate for 2. Thus, adequate guidance was available in the current FIST-V partly due to design constraints inherent in the vehicles since the FIST-V is a modification of the M901 Improved TOW Vehicle. GRA

N86-14898# Coast Guard, Washington, D.C. Office of Research and Development.
A COMPARISON OF THE PROTECTION AGAINST IMMERSION HYPOTHERMIA PROVIDED BY COAST GUARD ANTI-EXPOSURE CLOTHING IN CALM VERSUS ROUGH SEAS Final Report
A. M. Steinman, M. J. Nemiroff, J. S. Hayward, and P. S. Kubilis Jun. 1985 86 p
(AD-A158413; USCG-D-17-85) Avail: NTIS HC A05/MF A01 CSCL 06/17

The purpose of this study was to compare the protection against immersion hypothermia provided by various types of Coast Guard Operational clothing to survivors of mishaps in calm versus rough seas. Eight garment ensembles were evaluated: (1) flight suit (control); (2) full wet suit and (3) shorty wet suit (tight-fitting wet garments); (4) aviation antiexposure coveralls; (5) boatcrew antiexposure coveralls, and (6) thermal float coat (loose-fitting wet garments); (7) dry suit; (8) survival suit (dry garments). Mean calm-water temperature was 10.7 C. Rough water mean temperature was 11.1 C. with 4 to 6 foot swells, occasional 4-foot breaks, 2 to 3 foot wind-waves and 0 to 3 knots current. Eight volunteer Coast Guard crewmen wore each garment-ensemble once in each of the two sea conditions. Dependent variables were rectal temperature, groin skin temperature, back skin temperature, heart rate, and subjective evaluations of warmth, tightness of garment fit, and amount of cold water flushing. The results showed signficantly faster mean rectal temperature cooling rates and significantly larger declines in skin temperatures in rough seas than in calm seas for subjects wearing the float coat, aviation anti-exposure coveralls and boatcrew coveralls. Heart rates were significantly faster in rough seas than in calm seas for all garments. Rectal and skin temperature changes were positively correlated with each other and with subjective evaluation of cold water flushing, but they were negatively correlated with warmth and tightness of fit. In general, dry garments provided better protection than did wet garments in both sea conditions, and tight-fitting wet garments provided better protection than did loose-fitting wet garments in rough seas. GRA

N86-14899# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
TEAM PERFORMANCE WITH LARGE AND SMALL SCREEN DISPLAYS
C. E. Brown and D. G. Leupp Jun. 1985 20 p
(AD-A158761; AAMRL-TR-85-033) Avail: NTIS HC A02/MF A01 CSCL 05/8

Large displays are common in modern command centers, yet the rationale for their use is typically weak. A literature search revealed little previous work comparing performance of teams with large group displays versus individual CRT's. The most applicable previous studies used static tasks and photographic projection systems. The study described here used a complex, dynamic task which required extensive interaction between members of three-person teams to achieve best performance. A comparison was made between the performance of three-person teams viewing either one large screen display or three individual CRT's. Results indicate that display size did not strongly affect team performance, although there were differences in the details of task performance that are attributable to display variables. GRA

N86-14900# Clarke Ambrose, Inc., Knoxville, Tenn.
HUMAN-MACHINE INTERFACE IN MOBILE TELEOPERATORS
J. V. DRaper 1985 15 p Presented at the Workshop on Requirements of Mobile Teleoperators for Radiological Emergency Response and Recovery, Dallas, 23 Jun. 1985
(Contract DE-AC05-84OR-21400)
(DE85-013639; CONF-8506148-1) Avail: NTIS HC A02/MF A01

Several reasons are given for the importance of human operators. An ideal human teleoperator interface called telepresence is defined. It is concluded that the human machine interface is not ideal, and that it may be improved, and that available and developing technology can improve interfaces. E.R.

N86-14901# Little (Arthur D.), Inc., Cambridge, Mass.
ABRASION-RESISTANT ALUMINIZED-COATED ARAMID FABRICS FOR MANUFACTURE OF FIREFIGHTERS' PROTECTIVE CLOTHING Final Technical Report
R. Brenneman 10 Oct. 1985 71 p
(Contract N00140-83-C-RA12)
(AD-A157056; ADL-88860; NCTRF-160) Avail: NTIS HC A04/MF A01 CSCL 11/5

The required yardage of two experimental approaches to developing an abrasion resistant fabric for firefighters protective clothing has been delivered to NCTRF, Natick, Ma, for fabrication into uniforms. The first is an electron-beam (EB) cured coating on

the two-side aluminized mylar used in the existing laminated fabric. The second is a one-side aluminized Kapton (K) film laminated metal side to Kevlar fabric. The Kapton product illustrates the principle that a high temperature melting point film, aluminized on one side and laminated metal side down to Kevlar fabric, can provide abrasion and chemical resistance as well as reflectivity. However, its water absorption and adhesive characteristics severely limit use in the water-prone firefighters environment. We believe other high-temperature melting resins, such as polysulfone or polyether-imide, would probably have more suitable adhesive properties than Kapton because they are more water resistant. Both the esperimental EB and Kapton products absorb more heat than the existing product because they reflect less infrared energy than the pure aluminum on the existing product. It is a fundamental fact that only gold metal can be coated on aluminum without reducing its reflectivity of the aluminum. GRA

N86-14946# Rutgers - The State Univ., New Brunswick, N. J. Dept. of Mechanical Industrial and Aerospace Engineering.

APPLICATION OF SCREW CALCULUS TO THE EVALUATION OF MANIPULATOR WORKSPACE

L. M. Hsia and T. W. Lee *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 765-785 (For primary document see N86-14902 05-59)
(AD-P004947) Avail: NTIS HC A99/MF E03 CSCL 12/1

55 PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

N86-14902# Army Research Office, Research Triangle Park, N. C.

TRANSACTIONS OF THE SECOND ARMY CONFERENCE ON APPLIED MATHEMATICS AND COMPUTING

Feb. 1985 952 p refs Conference held in Troy, N.Y., 22-25 May 1984; sponsored by the Army Mathematics Steering Committee
(AD-A154047; ARO-85-1) Avail: NTIS HC A99/MF E03 CSCL 12/1

Various topics in the field of applied mathematics that are relevant to the U.S. Army are presented. For individual titles, see N86-14903 through N86-14957.

N86-14903# Columbia Univ., New York. Dept. of Mechanical Engineering.

COMPUTER-AIDED MECHANISMS ANALYSIS AND DESIGN **c61**

F. Freudenstein *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 1-12 (For primary document see N86-14902 05-59)
(AD-P004902) Avail: NTIS HC A99/MF E03 CSCL 13/9

The modern deployment of the subject of mechanisms has been influenced heavily by high-speed computation. This is due primarily to the nonlinearity, complexity and variety of the mechanical elements involved. Recent developments and research in this area will be reviewed with emphasis on conceptual design, kinetmatic analysis and synthesis and dynamic analysis. Author (GRA)

N86-14904# Army Foreign Science and Technology Center, Charlottesville, Va.

VALIDATION OF A MULTILAYERED VISCOELASTIC SEISMIC PROPAGATION MODEL FOR SHORT TO MEDIUM RANGES **c46**

B. L. Carnes *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 13-35 (For primary document see N86-14902 05-59)
(AD-P004903) Avail: NTIS HC A99/MF E03 CSCL 12/1

Field tests were conducted to provide a complete data base for valication of the Army Engineer Waterways Experiment Station Seismic Propagation Model. The model was developed in 1973 to predict seismic signals resulting from a variety of seismic sources, but had not been validated for short to medium ranges (up to 10 km). Model predictions compared favorably with tests results and after a refinement of site physical properties and internal damping factor (or g), calculations were even more compatible. The model will now be available for making predictions at other sites with a greater degree of reliability. The validation procedure included preliminary prediction, testing and verification of data, and model reinfement and validation. Author (GRA)

N86-14905# Army Materials and Mechanics Research Center, Watertown, Mass.

BUCKLED ELASTICA IN CONTACT: FINITE ELEMENT SOLUTIONS **c39**

A. R. Johnson and C. J. Quigley *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 37-47 (For primary document see N86-14902 05-59)
(AD-P004904) Avail: NTIS HC A99/MF E03 CSCL 12/1

The analysis of manufacturing processes for metal sheets, stresses in elastomer bumpers and other geometrically nonlinear problems require numerical techniques which an deal with continuously changing regions of contact. The most common method of dealing with the contact problem is to introduce gap elements in the contact region. These elements provide either zero or very large stiffness between two degrees of freeom. The methods for determing gap element stiffness include computations which determine if contact has been made. In this effort, a revised simplex method of quadratic programming is investigated for treating contact problems. The method allows the contact problem to be treated directly as a minimization problem subject to an inequality constraint without the need to define gap elements. To test the effectiveness of the algorithm the problem of the buckled elastica in contact with itself was solved. An existing finite element formulation for the extensional elastica based on the minimum potential energy principle is used to model the buckled elastica. Solutions to the contact problem are also obtained by a penalty method using gap elements. Results from both numerical methods are compared to theoretical results. Author (GRA)

N86-14906# Wisconsin Univ., Madison. Mathematics Research Center.

OPTIMAL CONTROL TECHNIQUES FOR COMPUTING STATIONARY FLOWS OF VISCOELASTIC FLUIDS WITH MEMORY **c34**

P. LeTallec *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 49-59 (For primary document see N86-14902 05-59)
(AD-P004905) Avail: NTIS HC A99/MF E03 CSCL 12/1

This article considers the problem of computing the stationary flows of a viscoelastic fluid with memory flowing through a given domain. The proposed numerical technique is based on optimal control techniques, which replace the original equations of the problem by a minimization problem to be solved by a conjugate gradient algorithm. Such techniques are very powerful and can handle equations which change type, provided that, as done here, one uses an adequate preconditioning operator and that one computes efficiently the gradient of the function to be minimized. GRA

N86-14907# Ballistic Research Labs., Aberdeen Proving Ground, Md.

PROGRAMMING WITH BINARY RELATIONS AND AN ASSOCIATED ALGEBRA OF PROGRAMS **c61**

P. Broome *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 61-74 (For primary document see N86-14902 05-59)
(AD-P004906) Avail: NTIS HC A99/MF E03 CSCL 12/1

Mathematical logic is a particularly fruitful vehicle for expressing programs in a declarative style and seems well suited for artificial intelligence applications. On the other hand, Horn clause logic limited to conjunction and disjunction is somewhat primitive and low level. When programs are written as arbitrary n-ary relations, as in Prolog, hierarchically constructing more complex programs from simpler ones is often quite awkward. John Backus, in his 1977 Turing award lecture, described a well structured and expressive functional programming style along with a useful algebra of programs. However, programs as functions are less general than programs as relations. This work restricts logic programs to only binary relations and shows how to combine the backtracking of logic programming and the higher order operations of functional programming. This combination allows us to define a richer set of program forming operations that includes program inversion. We include new optimization rules and point out which FP-like rules are invalid in a relational context. As an example, we show how the algebra is used by synthesizing, from specifications, an efficient program for the N queens problem. Author (GRA)

N86-14908# Ballistic Research Labs., Aberdeen Proving Ground, Md.
CODE ITERATION FOR NOISY CHANNELS c33
A. B. Cooper, III *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 75-84 (For primary document see N86-14902 05-59)
(AD-P004907) Avail: NTIS HC A99/MF E03 CSCL 09/4

Error control codes having modest error correction capabilities and additional error detection features often are used beyond their correction abilities to force retransmission of messages under severe channel conditions. High noise or interference levels can cause a significant fraction of messages to experience multiple transmissions in order to provide successful delivery. To improve the reliability of message delivery, a second level of error control is examined. A nonbinary Reed-Solomon code treats each detected character error as an erasure: the location of the error is known, but the identify of the transmitted symbol is not. The decoder then fills in symbols which the channel has erased. The performance of such an error control scheme in a typical application is studied, and the assumed scheme is shown to provide significant improvement for a modest change. Author (GRA)

N86-14909# General Electric Co., Schenectady, N. Y.
APPLICATION OF MACSYMA TO KINEMATICS AND MECHANICAL SYSTEMS c61
M. A. Hussain and B. Noble *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 85-103 (For primary document see N86-14902 05-59)
(AD-P004908) Avail: NTIS HC A99/MF E03 CSCL 12/1

The objective of this paper is to illustrate that symbol manipulation systems can readily handle many of the typical symbolic calculations arising in the formulation of problems in kinematics and mechanical systems. The paper consists of two parts. First, the authors discuss the use of MACSYMA in connection with the algebraic manipulations involved in transferring a body from one position to another in space, with particular reference to Rodrigues and Euler parameters and successive rotations, and an example involving quaternions. Second, they indicate how MACSYMA can be used to set up dynamical equations for the Stanford manipulator arm, and a spacecraft problem. GRA

N86-14910# Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Civil Engineering.
DYNAMIC INSTABILITY OF THE FLEXIBLE COUPLER OF A FOUR-BAR MECHANISM c39
I. G. Radjbakhsh *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 105-116 (For primary document see N86-14902 05-59)
(AD-P004909) Avail: NTIS HC A99/MF E03 CSCL 12/1

Dynamic behavior of flexible components of mechanisms is prone to instabilities which create resonant speed barriers. By considering small deformations superimposed on the steady dynamic state equations governing evolution of disturbances can be obtained. For the case of mechanisms driven by periodic inputs these equations reduce to a system of coupled Mathieu-Hill equations for the amplitudes of modes of vibrations. Application of the Floquet theory determines the critical conditions of speed, geometry and material properties causing dynamic instability. Author (GRA)

N86-14911# Wisconsin Univ., Madison. Mathematics Research Center.
AN INTRODUCTION TO THE SCIENTIFIC COMPUTING LANGUAGE PASCAL-SC c61
L. B. Rall *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 117-148 (For primary document see N86-14902 05-59)
(Contract DAAG29-80-C-0041)
(AD-P004910) Avail: NTIS HC A99/MF E03 CSCL 09/2

Microcomputers are now being widely used for small-scale scientific, engineering, and statistical computing. Pascal-SC (Pascal for Scientific Computing) is a language which has been developed specifically for this application. Its most important features are: (1) accurate floating-point arithmetic for real, complex, and interval numbers, vectors, and matrices, with controlled rounding if desired; (2) the convenience of operator notation for numerical data types, which makes programs easier to write, read, and document, together with the ability to accept user-defined operators for nonstandard data types; and (3) compatibility with ordinary Pascal, so that Pascal programming techniques and programs already written in Pascal can be used immediately. In Pascal-SC, solutions of linear systems of equations, inverse of matrices, and eigenvalues and eigenvectors are computed with guaranteed error bounds, and scalar products of vectors and sums of arbitrary length of floating-point numbers of are computed to the closet floating-point number, or rounded as desired. These basic features of Pascal-SC will be described, together with applications to research on numerical methods which have been carried out on a microcomputer. Author (GRA)

N86-14912# Wayne State Univ., Detroit, Mich. Dept. of Mathematics.
OPTIMAL CORRECTIONS OF A DAMPED LINEAR OSCILLATOR UNDER RANDOM PERTURBATIONS c39
P. L. Chow and J. L. Menaldi *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 149-158 (For primary document see N86-14902 05-59)
(Contract DAAG29-83-K-0014)
(AD-P004911) Avail: NTIS HC A99/MF E03 CSCL 12/1

An additive control of a randomly excited linear damped oscillator is studied by the methods of dynamic programming and variational inequalities. The objective is to minimize the mean deviation from the rest position over a finite horizon, with a possible resource constraint. We shall present some analytical results on the optimal average cost function and the feedback control law. Numerical solution will be discussed briefly. Author (GRA)

N86-14913# Maryland Univ. Baltimore County, Catonsville.
NON-PERIODIC CONDITIONS FOR CHAOS AND SNAP-BACK REPELLERS c64
N. P. Bhatia and W. O. Egerland *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 159-164 (For primary document see N86-14902 05-59)
(AD-P004912) Avail: NTIS HC A99/MF E03 CSCL 12/1

Li and Yorke introduced in their fundamental paper the term chaotic for a class of self-mappings of an interval. Following the Li-Yorke result that period three implies chaos, many authors worked on periodic conditions that allow the same conclusion. Li and Yorke also introduced four-point inequalities satisfied by a point and its three successors with respect to the given function f. They showed that these imply the existence of a three-period

and hence chaos. The authors of this article began investigations under the US Army Summer Faculty Research and Engineering Program 1983, and showed that the Li-Yorke inequalities play a fundamental role in the theory of chaos. For this article they have singled out three theorems. The first is an addendum to the Li-Yorke theorem. The second establishes equivalent companion inequalities to the Li-Yorke inequalities. The third theorem, of a different character, is especially important in applications. We also introduce the elementary notion of a Newton function (our term) which we have found indispensable in the investigation of parameter families and which, we think, deserves to be better known. GRA

N86-14914# Indiana Univ.-Purdue Univ., Indianapolis.
ON THE NUMERICAL SOLUTION OF SINGULARLY PERTURBED LINEAR TWO-POINT BOUNDARY-VALUE PROBLEMS **c64**
B. S. Nq and W. H. Reid *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 165-175 (For primary document see N86-14902 05-59)
(Grants NSF MCS-81-01932; NSF MCS-83-01125)
(AD-P004913) Avail: NTIS HC A99/MF E03 CSCL 12/1

This article presents an initial-value technique, based on the use of certain compound matrices, for the numerical solution of linear two-point boundary-value problems involving unstable ordinary differential equations of the singular perturbation type. The authors demonstrate the effectiveness of the method via certain examples which exhibit internal as well as end-point boundary-layers. GRA

N86-14915# Wisconsin Univ., Madison. Mathematics Research Center.
SELF SIMILAR SOLUTIONS FOR A DEGENERATE CAUCHY PROBLEM **c64**
K. Hoellig and J. A. Nohel *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 177-183 (For primary document see N86-14902 05-59)
(Contract DAAG29-80-C-0041)
(AD-P004914) Avail: NTIS HC A199/MF E03 CSCL 12/1

In this article the authors determine the self-similar solutions of a Cauchy problem v sub t = psi(v) xx where x is an element of R when t < 0 and v(x,0) = g(x) for a constitutive function. GRA

N86-14916# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.
VARIATIONAL PRINCIPLE FOR PENETRATOR DYNAMICS USING BILINEAR FUNCTIONAL AND ADJOINT FORMULATION **c64**
C. N. Shen *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 185-197 (For primary document see N86-14902 05-59)
(AD-P004915) Avail: NTIS HC A99/MF E03 CSCL 12/1

The solution problems in both spatial and time domains using finite element method can be based on the variational principle employing bilinear functional and adjoint formulation. This principle is extended to coupling systems in matrix vector form such as penetration dynamics. The present hyperbolic type partial differential equation of interest has two dependent and two independent variables with the coupling in the spatial domain. Author (GRA)

N86-14917# Ballistic Research Labs., Aberdeen Proving Ground, Md.
REPRESENTATION OF TWO-PHASE FLOWS BY AVERAGING **c34**
A. Celmins *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 199-223 (For primary document see N86-14902 05-59)
(AD-P004916) Avail: NTIS HC A99/MF E03 CSCL 12/1

This article considers descriptors of gas-particle aggregates which represent space averaged local properties of the aggregate. It shows that such descriptors have undulations due to the finite size of the averaging volume, and derive an estimate for the bounds of the amplitude of the undulations. According to that estimates, one obtains reasonably accurate averages only if the averaging volume contains at least 30-150 particles. In terms of the size of the averaging volume this limitation means that the diameter of the volume should equal at least four to five mean distances between particle centers. A consequence for the modeling of two-phase flows through tubes is that space averaged descriptors cannot resolve the radial structure of such flows unless the mean particle distance is much smaller than one tenth of the tube diameter. This condition excludes, for instance, the use of average descriptors for radial flow resolution of some interior ballistic flows, where the particulate phase consists of propellant grains. We also derive an approximate characterization of the boundary of a particle aggregate r different sizes of the averaging volume. GRA

N86-14918# Cornell Univ., Ithaca, N.Y. Dept. of Theoretical and Applied Mechanics.
NUMERICAL INVESTIGATION OF THE STABILITY OF DIFFUSION FLAMES NEAR EXTINCTION AND IGNITION **c25**
Y. S. Choi, C. Laine-Schmidt, and G. S. S. Ludford *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 225-230 (For primary document see N86-14902 05-59)
(AD-P004917) Avail: NTIS HC A99/MF E03 CSCL 12/1

A numerical investigation is made of the near-ignition and near-extinction characteristics of chambered diffusion flames for arbitrary Lewis numbers. In particular, for an S-shaped response curve, both dynamic ignition and extinction are found to occur at the turning points. While the stability of premixed flames has received considerable attention in the mathematical theory of laminar flames that has been developed in the last decade or so, diffusion flames have almost been ignored. Even in the context of plane flames subjected to one-dimensional disturbances there is much to be done, in particular when the response curve of steady states is S-shaped. GRA

N86-14919# Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Mathematical Sciences.
FLUID MECHANICS OF QUENCHING **c34**
D. A. Drew, R. Brent, S. Melly, W. Schroeder, and S. Wells *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 231-252 (For primary document see N86-14902 05-59)
(AD-P004918) Avail: NTIS HC A99/MF E03 CSCL 20/4

An array of heated rods is lowered vertically in a cold water bath at a constant speed V in order to quench them to obtain desired mechanical properties. Relative to the rods, the water flows in a subchannel, is heated, and boils, while cooling the rods. A model is proposed and studied which considers a one dimensional flow in a subchannel. It is argued that the heat release occurs in a thin region, where water is heated to boiling conditions and boils completely to steam. Above this boiling layer, steam flows rapidly against the friction of the rod bundle. Below the boiling layer, the water flow is approximately hydrostatic. This results in the boiling layer moving at a constant speed proportional to V. The effect of cross flow (leaking into or out of the channel) is also investigated, and the results discussed. Author (GRA)

N86-14920# Cornell Univ., Ithaca, N.Y. Dept. of Theoretical and Applied Mechanics.
BEYOND STEFAN PROBLEMS: THE STRUCTURE OF SHEARED SOLIDIFICATION FRONTS **c26**
F. S. Hall and G. S. S. Ludford *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 253-259 (For primary document see N86-14902 05-59)
(AD-P004919) Avail: NTIS HC A99/MF E03

Determination of the motion of a solidification front into a molten metal, a so-called Stefan problem, does not depend on detail of the solidification process inside the front. Such details are needed, however, when the liquid is being stirred by a magnetic field, since they determine the structure of the coincident Hartman (viscous) layer, and hence the secondary motion in the liquid. Within this layer the viscosity is variable, due to the spacial variation in the concentration of solid particles. In the absence of a theory

in the nucleation literature, a growth law for the concentration of solid particles is proposed for the small undercooling that must occur in such a layer. The (asymptotic) analysis is carried out for the slow solidification of a cylinder of molten metal that is being stirred by a rotating, uniform magnetic field, but the results are of general validity. GRA

N86-14921# Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Mathematical Sciences.
SHOCK-INDUCED THERMAL RUNAWAY **c25**
T. L. Jackson and A. K. Kapila *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 261-272 (For primary document see N86-14902 05-59)
(AD-P004920) Avail: NTIS HC A99/MF E03 CSCL 07/4

Ignition of an initially cold combustible gas is studied when chemical reaction is switched on due to the passage of a piston-supported shock of sufficient strength. The time and space history of the shocked gas up to the instant of thermal runaway is described, by using a combination of asymptotics and numerics. Consider a combustible material confined to the half space $x < 0$ and capable of undergoing an exothermic chemical reaction of the Arrhenius type. Suppose that the temperature of the material is so low that it is practically inert, and will not burn if left alone. Let combustion be initiated by applying an ignition stimulus at the boundary $x = 0$. It is of considerable interest to obtain a mathematical description of the events following the application of the stimulus. In particular, if a combustion wave propagating through the material is eventually established, it is important to understand the evolutionary process that gives rise to it. GRA

N86-14922# Cornell Univ., Ithaca, N.Y. Dept. of Theoretical and Applied Mechanics.
THE STEFAN PROBLEM OF DETONATION THEORY **c34**
A. A. Oyediran and G. S. S. Ludford *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 273-283 (For primary document see N86-14902 05-59)
(AD-P004921) Avail: NTIS HC A99/MF E03 CSCL 12/1

A certain model of one-dimensional detonation waves leads to a Stefan problem: the unknown f satisfies Burgers equations on the two sides of a moving discontinuity at which it is given (f, say) and the jump in it derivative (corresponding to the exothermic reaction) is prescribed. An alternative formulation of the problem can be obtained by means of the Hopf-Cole transformation, which replaced the Burgers equations by diffusion - type equations. The problem possesses a steady solution, the discontinuing moving with constant speed and f depending only on distance from it. This solution is stable for a range of the parameter f, and unstable otherwise, as was shown at the First Army Conference, when preliminary results on the subsequent evolution of the instability were presented. The instability has now been reexamined, using three computation schemes on each of the two formulations of the problem, resulting in the more definite conclusions presented here. Author (GRA)

N86-14923# Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Mechanical Engineering Aeronautical Engineering and Mechanics.
FINITE INCREMENT FORMULATION OF THE PRANDTL-REUSS CONSTITUTIVE EQUATIONS **c67**
R. L. Mallett *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 285-301 (For primary document see N86-14902 05-59)
(AD-P004922) Avail: NTIS HC A99/MF E03 CSCL 12/1

The early finite increment formulations of elastic-plastic constitutive laws for use in large deformation finite-element codes placed severe limits on step size in order to avoid significant error accumulation. In this paper finite increment forms of the constitutive equations for Prandtl-Reuss materials are investigated, two primary sources of finite increment error are identified, and procedures for elimination of these errors are developed. By adopting a geometric description in nine-dimensional stress space, the relevant stress and strain increments are shown to all lie in a two-dimensional subspace. This allows the nature of the errors and the description of procedures which overcome them to be easily and precisely visualized with the aid of planar vector diagrams. Author (GRA)

N86-14924# Sandia National Labs., Albuquerque, N. Mex.
CONSTITUTIVE FEATURES OF SOLIDS AT SHOCK-WAVE LOADING RATES **c39**
D. E. Grady *In* ARO Transations of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 303-311 Previously announced as N85-12325 (For primary document see N86-14902 05-59)
(Contract DE-AC04-76DP-00789)
(AD-P004923) Avail: NTIS HC A99/MF A01 CSCL 20/14

Solids subjected to high-velocity impact or explosive loading exhibit unusual transient and post-shock properties during the extremely brief period associated with the shock-wave risetime and release. These features can include a unique solid-state shock viscosity behavior, anomalous transient shock-hardening effects, heterogeneous shear effects during the shock risetime, and shock-induced solid state and metallurgical transformations. Improved methods in time-resolved instrumentation are critical in the emerging understanding of these constitutive features. An increasing sophistication in physical and computational model is required to incorporate these effects in applied problems of dynamic solid mechanics. DOE

N86-14925# Minnesota Univ., Minneapolis. Dept. of Aerospace Engineering and Mechanics.
EXAMPLES AND SIGNIFICANCE OF CHANGE OF TYPE IN VISCOELASTICITY **c34**
D. D. Joseph, M. Renardy, and J. C. Saut *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 313-318 (For primary document see N86-14902 05-59)
(Contract DAAG29-82-C-0051)
(AD-P004924) Avail: NTIS HC A99/MF E03 CSCL 12/1

Equations governing the flow of viscoelastic fluids are classified according to the symbol of their differential operators. Conditions for a change of type in steady two-dimensional flows are derived for a three-constant Oldroyd model. The authors find a change of type in the vorticity equation when a critical condition involving speeds and stresses is satisfied. They also sketch how change of type can be discussed for more general models. GRA

N86-14926# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.
A MORE ACCURATE SOLUTION TO THE ELASTIC-PLASTIC PROBLEM OF PRESSURIZED THICK-WALLED CYLINDERS **c39**
P. C. T. Chen *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 319-329 (For primary document see N86-14902 05-59)
(AD-P004925) Avail: NTIS HC A99/MF E03 CSCL 20/11

A new method has been developed for solving the partially plastic problems of thick-walled cylinders made of strain-hardening or ideally-plastic materials subjected to any combination of internal pressure, external pressure, and end loads. The incremental strains are chosen as the basic unknowns in the finite-difference formulation. The incremental sizes of the applied loading are determined automatically and no iteration is needed. Complete solutions for the stresses, strains, and displacement have been obtained and all numerical results are very accurate. This approach is also efficient and simple, yet quite general, when compared with many solutions in the literature. Author (GRA)

N86-14927# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
A REFINED SHEAR DEFORMATION THEORY FOR LAMINATED ANISOTROPIC PLATES **c39**
J. N. Reddy *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 331-342 (For primary document see N86-14902 05-59)
(AD-P004926) Avail: NTIS HC A99/MF E03 CSCL 12/1

An improved plate theory that accounts for the transverse shear deformation is presented. The theory is based on an assumed displacement field in which the inplane dispalcements are expanded in terms of the thickness coordinate up to the cubic term and the transverse deflection is assumed to be independent of the thickness coordinate. The governing differential equations of the theory are derived from the virtual work principle. The theory eliminates the need for shear correction factors because the transverse shear stresses are represented parabolically. A comparison of the present numerical results for bending with the exact solutions of the three-dimensional elasticity theory shows that the present theory is more accurate than the first order shear deformation theory. GRA

N86-14928# Army Materials and Mechanics Research Center, Watertown, Mass.
ANISOPARAMETRIC FINITE ELEMENT METHODOLOGY FOR PENALTY CONSTRAINS FORMULATIONS IN SOLID MECHANICS **c64**
A. Tessler *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 343-358 (For primary document see N86-14902 05-59)
(AD-P004927) Avail: NTIS HC A99/MF E03 CSCL 12/1

A discussion of what is called the anisoparametric finite element method, suited for penalty constraint formulations, is presented in the context of displacement flexure elements. Two auxiliary criteria for the kinematic field are elaborated, on which basis the desired interpolation assumptions are established. Much attention is devoted to the lowest order triangular plate element. Several numerical experiments are conducted to ascertain the element performance. Author (GRA)

N86-14929# Army Materials and Mechanics Research Center, Watertown, Mass.
IMPORTANCE OF CRACK TIP SHAPE IN ELASTIC-PLASTIC FRACTURE ANALYSIS **c39**
In ARO Transations of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 359-371 (For primary document see N86-14902 05-59)
(AD-P004928) Avail: NTIS HC A99/MF E03 CSCL 20/11

Elastic-plastic solutions for two crack problems are discussed. The problems involve blunt cracks. In one case, the crack tip geometry is semi-circular with parallel flanks; in the other case, a circular tip geometry is considered. The authors refer to these as the U-tip and keyhole crack problems. The cracks have finite length and are within an infinite domain under plane strain constraint. Far from the crack a uniform tensile stress state is specified. The solution history to a remote stress level equal to 28% of the yield stress was obtained for each problem. Slipline analysis suggests that the near tip stress distribution or these cases and others such as the narrow ellipse and perfectly sharp crack are significantly different. GRA

N86-14930# Army Materials and Mechanics Research Center, Watertown, Mass.
KINEMATIC HARDENING APPLIED TO NON-PROPORTIONAL LOADING **c39**
C. S. White *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 373-387 (For primary document see N86-14902 05-59)
(AD-P004929) Avail: NTIS HC A99/MF E03 CSCL 20/11

A series of critical experiments in the determination of a plastic flow rule is re-examined using kinematic hardening. Non-proportional loading experiments on thin-walled, aluminum tubes were conducted by Budiansky, Dow, Peters, and Shepherd in 1951 to determine whether plastic flow exhibits behavior consistent with the physical, slip theory of plasticity or with the phenomenological, J sub 2 flow and deformation theories. Their results were mixed since none of these theories predict the full range of exhibited, material behavior. Pan and Rice have sparked recent interest in these experiments by introducing a slight rate dependence into slip theory. Through a judicious choice of a strain rate sensitivity parameter they match the experiments reasonably well. This article reports on the comparison of these experiments against the predictions of a flow rule based on the Prager/Ziegler kinematic hardening theory. Both shear and axial strains are predicted for a variety of load histories. Results show good agreement between theory and experiment. The implications to buckling and instability analysis are briefly discussed. GRA

N86-14931# National Bureau of Standards, Gaithersburg, Md.
THE INVERSE GAUSSIAN PULSE IN THE EXPERIMENTAL DETERMINATION OF LINEAR SYSTEM GREEN'S FUNCTIONS **c64**
A. S. Carasso and N. N. Hsu *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 389-404 (For primary document see N86-14902 05-59)
(Contract MIPR-ARO-63-82)
(AD-P004930) Avail: NTIS HC A99/MF E03 CSCL 12/1

This article presents a new time domain deconvolution method for determining the impulse response of linear time invariant systems. The method is based on the use of the one-sided, causal, inverse Gaussian pulse as an approximation to the Dirac delta-function. Deconvolution of that kernel is equivalent to an inverse heat conduction problem. The method is particularly useful in cases where the Green's function for the linear system has singularities such as jumps, cusps, spikes, and the like. Computational reconstructions of singularities, from smoth synthetic data, are presented in the context of Acoustic Emission Green's functions. Author (GRA)

N86-14932# Aeronautical Research Associates of Princeton, Inc., N. J.
AN ANALYTICAL MODEL OF PERIODIC WAVES IN SHALLOW WATER, SUMMARY **c43**
H. Segur and A. Finkel *In* ARO Transations of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 459-470 Previously announced as N85-16086 (For primary document see N86-14902 05-59)
(AD-P004932) Avail: NTIS HC A99/MF E03 CSCL 12/1

An analytical model is presented of finite amplitude waves in shallow water. The waves discussed have two independent spatial periods, in two independent horizontal directions. Both short-crested and long-crested waves are available from the model, and every wave pattern is an identical solution of the Kadomtsev-Petviashvili equation, based on a Riemann theta function of genus 2. These bi-periodic waves are direct generalizations of the well-known (simply periodic) cnoidal waves. Just as cnoidal waves are often used as one-dimensional models of typical nonlinear, periodic waves in shallow water, these bi-periodic waves may be considered to represent typical nonlinear, periodic waves in shallow water without the assumption of one-dimensionality. GRA

N86-14933# Pennsylvania State Univ., University Park. Wave Propagation Lab.
ON AN IMPROVED T-MATRIX APPROACH TO STUDY THE SCALAR SCATTERING RESPONSE OF DOUBLY PERIODIC SURFACES **c64**
A. Lakhtakia, V. K. Varadan, and V. V. Varadan *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 471-481 (For primary document see N86-14902 05-59)
(AD-P004933) Avail: NTIS HC A99/MF E03 CSCL 12/1

In investigating the scattering response of a periodic surface, the use of incomplete or inappropriate basis functions for representing the field(s) induced on the scattering surface has given rise to what is now called the Rayleigh Hypothesis (RH). Here the authors use normalized Fourier bases for this purpose and develop a T-matrix which completely characterizes the scalar scattering response of such a surface. The Rayleigh limits are effectively bypassed, and the obtained solutions are seen to obey unitarity as well as reciprocity contraints. They also show that the measurement of the scattered field can lead to two different interpretations of the nature of the scattering surface in inverse shape problems Author (GRA)

N86-14934# Clarkson Coll. of Technology, Potsdam, N.Y. Dept. of Mechanical and Industrial Engineering.
SOLITARY, PERIODIC AND CHAOTIC WAVES IN THIN FILMS **c25**
S. P. Lin and O. Suryadevara *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 483-499 (For primary document see N86-14902 05-59)
(AD-P004934) Avail: NTIS HC A99/MF E03 CSCL 12/1

A three-dimensional phase space analysis is carried out for a parabolic fourth order partial differential equation. This equation describes the time evolution of a class of nonlinear waves observed in viscous liquid films, diffusion flames and certain chemical oscillations. Solitary waves, almost periodic waves, as well as locally periodic but globally chaotic waves are found numerically.
Author (GRA)

N86-14935# Illinois Univ., Chicago. Dept. of Civil Engineering Mechanics and Metallurgy.
DISCONTINUOUS DEPENDENCE OF SOLUTION ON BOUNDARY CONDITIONS FOR LARGE AMPLITUDE SHOCK WAVES **c64**
T. C. T. Ting *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 501-511 (For primary document see N86-14902 05-59)
(AD-P004935) Avail: NTIS HC A99/MF E03 CSCL 12/1

Plane waves of finite amplitude in a simple elastic solid which occupies the half space $x < or = 0$ are studied. For isotropic materials there are two plane polarized simple waves as well as two shock waves and one circularly polarized simple wave which can be regarded as a shock wave. Using combination of simple waves and/or shock waves is needed to satisfy the initial and boundary conditions. For hyperelastic materials, the wave curves associated with different wave speed are orthogonal to each other. Examples are presented for second order hyperelastic materials. In one example we show that the solution requires as many as four simple waves. In another, when the amplitude of the applied shock is large enough, the solution, though does not blow up with time, does not depend continuously on the boundary conditions. Mathematically, this may create difficulties for a numerical solution of the problem. Physically, this means that if the applied load at the boundary is not properly controlled, any slight deviations in the applied load would result in a finite jump in the material response.
Author (GRA)

N86-14936# Coulter Electronics Co., Chicago, Ill.
FRONT TRACKING AND TWO DIMENSIONAL RIEMANN PROBLEMS: A CONFERENCE REPORT **c64**
J. Glimm, C. Klingenberg, O. McBryan, B. Plohr, and D. Sharp *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Comuting Feb. 1985 p 513-533 Previously announced as N85-21589 (For primary document see N86-14902 05-59)
(Contract DE-A02-76ER-03077)
(AD-P004936) Avail: NTIS HC A99/MF E03 CSCL 20/4

A substantial improvement in resolution was achieved for the computation of jump discontinuities in gas dynamics using the method of front tracking. The essential feature of this method is that a lower dimensional grid is fitted to and follows the discontinuous waves. At the intersection points of these discontinuities, two-dimensional Riemann problems occur. Two-dimensional Riemann problems are studied from both numerical and theoretical points of view. Specifically included is a numerical solution for the Mach reflection, a general classification scheme for two-dimensional elementary waves, and a discussion of problems and conjectures in this area.
DOE

N86-14937# Defence Research Establishment Valcartier (Quebec).
MIGRATION OF THE GAS GLOBE FROM UNDERWATER EXPLOSIONS: THE EFFECTS OF DRAG AND RADIATIVE ENERGY LOSS **c43**
K. C. Heaton *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 535-583 (For primary document see N86-14902 05-59)
(AD-P004937) Avail: NTIS HC A99/MF E03 CSCL 12/1

In this article the problem of the motion of the bubble from an underwater explosion is considered. Previous derivations of the equations of motion are summarized. It is shown how a Lagrangian method can be utilized to obtain the equations of motion, and how generalized dissipative forces can be formally incorporated. The generalized dissipative force for energy loss by radiation of sound is obtained from first principles, and found to be approximately proportional to the cube of the rate of change of the bubble radius with respect to time. The algorithm by which the equations of motion were solved numerically is briefly discussed, and some results of the computations presented. It is found that the approximate formula for energy loss by radiation of sound by a bubble in the absence of vertical motion (derived by Herring) gives results similar to those obtained using the more exact formulation developed in this work. It is also found that the rate of energy loss is affected slightly by processes analogous to radiation reaction in electromagnetic theory. Results are also presented for the cases for which energy is lost by drag as well as by radiation of sound, and for the case for which the effects of free and rigid surfaces on the bubble motion, but not energy loss, are considered.
Author (GRA)

N86-14938# Rensselaer Polytechnic Inst., Troy, N.Y.
A LOCAL REFINEMENT FINITE ELEMENT METHOD FOR TIME DEPENDENT PARTIAL DIFFERENTIAL EQUATIONS **c64**
J. E. Flaherty and P. K. Moore *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 03664 Previously announced as N85-17620 (For primary document see N86-14902 05-59)
(Contract DAAG29-82-K-0197; Grant AF-AFOSR-0192-80)
(AD-P004938) Avail: NTIS HC A99/MF E03 CSCL 12/1

The authors discuss an adaptive local refinement finite element method for solving initial-boundary value problems for vector systems of partial differential equations in one space dimension and time. The method uses piecewise bilinear rectangular space-time finite elements. For each time step, grids are automatically added to regions where the local discretization error is estimated as being larger than a prescribed tolerance. The authors discuss several aspects of their algorithm, including the tree structure that is used to represent the finite element solution and grids, and error estimation technique, and initial boundary conditions at coarse-fine mesh interfaces. The authors also present computational results for a simple linear hyperbolic problem, a problem involving Burger's equation, and a model combustion problem.
GRA

N86-14939# Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Civil Engineering.
POST-BUCKLING ANALYSIS OF AN ELASTIC WITH ONE AND MANY CRITICAL LOADS **c39**
I. G. Tadjbakhsh *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 597-610 (For primary document see N86-14902 05-59)
(AD-P004939) Avail: NTIS HC A99/MF E03 CSCL 12/1

Static stability of an elastic system composed of a flexible and a rigid link leads to a nonlinear eigenvalue problem with a single buckling load or infinite buckling loads when the flexible link is in tension or compression, respectively. Integration of equations of equilibrium leads to nonlinear singular integral equations which can be analyzed and solved numerically.
Author (GRA)

N86-14940# Rensselaer Polytechnic Inst., Troy, N.Y.
A MESH MOVING TECHNIQUE FOR TIME DEPENDENT PARTIAL DIFFERENTIAL EQUATIONS IN TWO SPACE DIMENSIONS **c64**
D. C. Arney and J. E. Flaherty *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 611-633 (For primary document see N86-14902 05-59)
(Contract DAAG29-82-K-0197; Grant AF-AFOSR-0192-80)
(AD-P004940) Avail: NTIS HC A99/MF E03 CSCL 12/1

This article discusses an adaptive mesh moving technique that can be used with a finite difference or finite element scheme to solve initial-boundary value problems for vector systems of partial differential equations in two space dimensions and time. The mesh moving technique is based on an algebraic node movement function determined from the propagation of significant error regions. The algorithm is designed to be flexible, so that it can be used with many existing finite difference and finite element methods. To test the mesh moving algorithm, the authors implemented it in a system code with an initial mesh generator and a MacCormack finite volume scheme on quadralateral cells for hyperbolic vector systems. Results are presented for several computational examples. The moving mesh scheme reduces dispersion errors near shocks and wave fronts and thereby reduces the grid requirements necessary to compute accurate solutions while increasing computational efficiency. GRA

N86-14941# Army Chemical Research and Development Center, Aberdeen Proving Ground, Md.

NUMERICAL SIMULATION OF FLUID EJECTION FROM A SPINNING CYLINDER **c34**

P. D. Fedele *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 635-647 (For primary document see N86-14902 05-59)

(AD-P004941) Avail: NTIS HC A99/MF E03 CSCL 12/1

A computer code, based on a convective flux approximation on a finite difference Eulerian grid, was to model the rate of fluid ejection from the opened end of an azimuthally rotating cylinder. The computer code, SOLA-VOF/CSL is described in a previous support. A constantly rotating cylinder, with an 80% fluid fill, is set in equilibrium solid body rotation and one end is instantaneously removed, allowing the centrifugal force to drive the fluid from the opened end. Fluid parameters have been chosen to model the behavior of water and glycerin at 25 C. The ratio of the volume ejection rate to the volume rotation shows similarity when expressed as a function of the cylinder rotation time. The fluid viscosity is observed to have negligible effect on the ejection rate for the spin rates of interest. This behavior is shown to be consistent with a dimensional analysis of the flows considered. GRA

N86-14942# Wisconsin Univ., Madison. Mathematics Research Center.

NOTE ON EVAPORATION IN POROUS MEDIA. **c34**

R. E. Meyer *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 693-711 (For primary document see N86-14902 05-59)

(Contract DAAG29-80-C-0041; Grant NSF MCS-82-15064)

(AD-P004943) Avail: NTIS HC A99/MF E03 CSCL 07/4

Factors are discussed which govern evaporation of liquid in the small capabilities of a porous medium. Attention is directed to sheet-like aggregates from which the vapor can escape with little obstruction. Marked temperature gradients are then found to be confined to close neighborhoods of the menisci and evaporation is shown to proceed in statistically quite unstable configurations under a dynamic balance of surface tension, local evaporation rate and viscous shear. Estimates of evaporation rates and fluid velocities are given. The results discourage constitutive theories for porous media because mere size of capabilities, independently of shape and chemistry, is found to change the physical processes underlying macroscopic behavior. Author (GRA)

N86-14943# Ballistic Research Labs., Aberdeen Proving Ground, Md.

JET-CONTAMINANT INTERACTIONS IN CONFINED GEOMETRIES **c34**

In ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 713-728 (For primary document see N86-14902 05-59)

(AD-P004944) Avail: NTIS HC A99/MF E03 CSCL 12/1

A numerical simulation is presented for investigation of the early phase of the flow interaction between a water jet and a chemical contaminant residing in cavities of a wall and in corners of two perpendicular walls. Such an interaction often occurs in surface decontamination processes. The flow model for this analysis is a two-dimensional, two-fluid flow governed by the unsteady Navier-Stokes equations. The equations were solved via finite difference schemes using the SOLA-VOF code. Computer plots of the flow development are presented. The results show that an inclined jet is more effective than a normal jet for decontaminating these confined geometries. In all flow cases studied, the impact pressure on the impingement wall far exceeds the corresponding steady-state dynamic pressure of the jet. GRA

N86-14944# Ballistic Research Labs., Aberdeen Proving Ground, Md.

A METHODOLOGY FOR THE DEVELOPMENT OF FIRE CONTROL EQUATIONS FOR GUNS AND ROCKETS FIRED FROM AIRCRAFT **c64**

H. J. Breaux *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 729-735 (For primary document see N86-14902 05-59)

(AD-P004945) Avail: NTIS HC A99/MF E03 CSCL 12/1

The accurate firing of unguided projectiles (bullets or rockets) from aircraft leads to a requirement for rapid computation of the launch vector needed to assure the projectiles striking a given target. The computation of this laying vector and fuze time is the function of the on board fire control system. The fire control system includes sensors which measure target range and velocity, aircraft attitude, position and velocity, and atmospheric conditions. These measurements are fed to an on-board fire control computer which in real time, typically at 50 Hz, must compute anew the laying vector appropriate for the rapidly varying variables which influence the ballistic trajectory. Six-degree-of-freedom models, which are normally used in laboratory ballistic modeling and simulation, are computationally too slow and otherwise cumbersome to be implemented for real time fire control. A methodology for developing an alternative simplified, yet very accurate, model is described in detail. Author (GRA)

N86-14945# Iowa Univ., Iowa City. Coll. of Engineering.

SINGULAR VALUE DECOMPOSITION FOR SOLUTION OF DIFFERENTIAL-ALGEBRAIC EQUATIONS OF MECHANICAL SYSTEM DYNAMICS **c64**

N. K. Mani and E. J. Haug *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 737-763 (For primary document see N86-14902 05-59)

(Grant DAAE07-82-G-4004)

(AD-P004946) Avail: NTIS HC A99/MF E03 CSCL 12/1

A computer-based method for solution of non-linear, constrained differential-algebraic equations of motion of mechanical systems is developed. The differential equations of motion and nonlinear holonomic constraint equations are written in terms of a maximal set of Cartesian generalized coordinates, to facilitate the formulation of constraints and forcing functions. Singular Value Decomposition of the constraint Jacobian matrix is used to generate a coordinate transformation that defines a new set of generalized coordinates that are naturally partitioned into independent and dependent sets, with several desirable properties. This information is used to construct a reduced system of independent differential equations of motion that can be integrated using standard numerical integration algorithms. It is also shown that the method speeds the iterative solution of dependent generalized coordinates from constraint equations. A physically reasonable method is presented to determine equations. A physically reasonable method is presented to determine when the choice of independent generalized coordinates needs to be changed. A tracked vehicle example is presented to illustrate the method and its advantages over other methods of solution. Author (GRA)

N86-14946# Rutgers - The State Univ., New Brunswick, N. J. Dept. of Mechanical Industrial and Aerospace Engineering.

APPLICATION OF SCREW CALCULUS TO THE EVALUATION OF MANIPULATOR WORKSPACE **c54**

L. M. Hsia and T. W. Lee *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 765-785 (For primary document see N86-14902 05-59)

(AD-P004947) Avail: NTIS HC A99/MF E03 CSCL 12/1

In this paper, an analytical technique is presented that is based on screw calculus and dual-number matrices to derive the kinematic equations and the workspace formulations of robotic manipulators. A computational procedure for quantitative evaluation of workspace volume is also developed. Several examples are chosen to demonstrate the usefulness and the effectiveness of the approach. One of the basic problems encountered in manipulator design is the determination of the shape of workspace and its characteristics. The workspace, which is the one of operation of a manipulator, is the space associated with possible positions and orientations of the last link of a manipulator. A knowledge of the workspace of a manipulator can provide a measure of the efficiency of the design. Therefore, the investigation on workspace is a fundamental interest. GRA

N86-14947# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.

RECURSIVE GRADIENT ESTIMATION USING SPLINES FOR NAVIGATION OF AUTONOMOUS VEHICLES c64

C. N. Shen *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 787-808 (For primary document see N86-14902 05-59)

(AD-P004948) Avail: NTIS HC A99/MF E03 CSCL 12/1

Terrain gradient estimation is needed for navigation of an autonomous vehicle in climbing the hills. The in-path and cross-path terrain slopes are estimated from the set of corresponding range slopes. A two-dimensional recursive smoothing algorithm using polynomial splines in the third dimension is developed for this purpose. Approximations are introduced in the sub-optimal system so that the computation time increases only linearly with the size of the two-dimensional data. The successful development of an autonomous vision system for mobile vehicles would be of considerable value and importance to defense and related fields. Numerous reports and studies currently recommend artificial intelligence/robotics applications which require autonomous vehicles. Essential to these robotic vehicles is an adequate and efficient computer vision system. A potentially more successful approach, other than TV pictures and photographs, would be to develop a three-dimensional system employing a laser range-finder. GRA

N86-14948# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Mathematics.

ON PHASE TRANSITIONS WITH INTERFACIAL ENERGY c34

M. E. Gurtin *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics Math. and Computing Feb. 1985 p 809-813 (For primary document see N86-14902 05-59)

(Contracts DAAG29-82-K-0002; DAAG29-80-C-0041)

(AD-P004949) Avail: NTIS HC A99/MF E03 CSCL 12/1

This article considers a fluid which has free energy psi(the), a prescribed function of density rho, and which occupies a fixed container omega, with omega a bounded region in R sub 3. GRA

N86-14949# Army Natick Research and Development Command, Mass.

A COMPUTATIONAL METHOD FOR FIELD DETECTION OF UNKNOWN SUBSTANCES c64

E. W. Ross *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 815-833 (For primary document see N86-14902 05-59)

(AD-P004950) Avail: NTIS HC A99/MF E03 CSCL 12/1

This report is about computational methods in the detection of unknown substances by means of their spectra. The method of least-squares is used to test whether an unknown spectrum is one of the previously-stored set of spectra of compounds known to be of interest. The requirements are that reasonable certainty of detection. The programs are first described, then tested by simulation. The results suggest that the procedure is feasible although further improvement is probably desirable. Author (GRA)

N86-14950# Cornell Univ., Ithaca, N.Y. Dept. of Computer Science.

MATHEMATICAL FOUNDATIONS FOR ROBOTICS c63

J. E. Hopcroft *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 835-837 (For primary document see N86-14902 05-59)

(AD-P004951) Avail: NTIS HC A99/MF E03 CSCL 12/1

A major component of robotics is concerned with the representation and manipulation of physical objects. The design of computer algorithms to interact with these representations and to carry out task planning raises many mathematical and computational issues that are not well understood. This article explores some of these issues and outline areas where mathematical development is needed to support a robotics effort. Task level planning is an important aspect of robotics. What is needed is the ability to communicate a task to a robot at the level of insert peg in hole and have the detailed instructions such as open gripper, move to location x, rotate gripper, etc. be automatically generated by a computer. To do this requires solving many problems. First, one must be able to automatically deduce a grip position that will not interface with the desired task. Then one must develop an approach strategy that will insure gripping even in the presence of some uncertainty of position. Finally one must be able to plan motion. GRA

N86-14951# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.

DYNAMIC RESPONSE IN AN ELASTIC-PLASTIC PROJECTILE DUE TO NORMAL IMPACT c39

P. C. T. Chen, J. E. Flaherty, and J. D. Vasilakis *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 839-858 (For primary document see N86-14902 05-59)

(AD-P004952) Avail: NTIS HC A99/MF E03 CSCL 12/1

A numerical study of the dynamic response of an elastic-plastic projectile due to normal impact has been made using the finite element structural response code ADINA. The projectile is a finite length circular cylindrical bar striking a rigid target. First, three (central-difference, Newmark, Wilson) direct integration schemes were used for uniaxial stress wave problems in a linear-hardening material and the results were compared with an exact analytical solution in order to evaluate accuracy and stability. Then, additional numerical results for perfectly-plastic materials were obtained in order to show the effect of strain-hardening. Finally, some results for a multi-linear material model based on two-dimensional elements are presented in order to show the lateral effect. Author (GRA)

N86-14952# Wisconsin Univ., Madison. Mathematics Research Center.

ON THE ASYMPTOTIC ANALYSIS OF TRAVELLING SHOCKS AND PHASE BOUNDARIES IN ELASTIC BARS c39

T. J. Pence *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 859-874 (For primary document see N86-14902 05-59)

(Contract DAAG39-80-C-0041; Grant NSF MCS-82-10950)

(AD-P004953) Avail: NTIS HC A99/MF E03 CSCL 20/11

This investigation is concerned with the propagation of shocks and phase boundaries in elastic solids. Attention is restricted to one-dimensional motions; for simplicity, imagine a bar in which transverse displacements are absent. The problem is introduced in section 2, where it is reviewed how change of phase phenomena can be modelled by means of a nonmonotonic stress-strain law. This section also treats the simple wave that develops whenever a nonzero load delta infinity is suddenly applied to the end of the bar. This simple wave would be expected to mirror in some fashion the ultimate state of affairs whenever the bar is gradually loaded at one end of the level delta infinity provided waves are not subsequently reflected back from the opposite end. Issues involved in such an asymptotic study are discussed in the third section. Section 4 addresses special considerations for materials in which the stress-strain law is piecewise linear. Then, in section 5, the author carriers out an asymptotic analysis for an example problem involving such a material. GRA

N86-14953# Illinois Univ., Chicago. Dept. of Civil Engineering Mechanics and Metallurgy.
EIGENFUNCTIONS AT A SINGULAR POINT IN TRANSVERSELY ISOTROPIC MATERIALS UNDER AXISYMMETRIC DEFORMATIONS **c39**
T. C. T. Ting, Y. Jin, and S. C. Chou *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 875-882 (For primary document see N86-14902 05-59)
(AD-P004954) Avail: NTIS HC A99/MF E03 CSCL 12/1

When a two-dimensional elastic body which contains a notch or a crack is under a plane stress or plane strain deformation, the asymptotic solution of the stress near the apex of the notch or crack is simply a series of eigenfunctions of the form rho delta f(psi, delta) in which (rho, psi) is the polar coordinate with origin at the apex and delta is the eigenvalue. If the body is a three-dimensional elastic solid which contains axisymmetric notches or cracks and subjects to an axisymmetric deformation, the eigenfunction associated with an eigenvalue contains not only the rho delta term, but also the rho delta + 1, rho delta + 2 terms. Therefore, the second and higher order terms of the asymptotic solution are not simply the second and subsequent eigenfunctions. The authors present the eigenfunctions for transversely isotropic materials under an axisymmetric deformation. The degenerate case in which the eigenvalues p sub 1 and p sub 2 of the elasticity constants are identical is also considered. The latter includes the isotropic materials under axisymmetric deformations. GRA

N86-14954# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering, Science and Mechanics.
HIGHLY VISCOUS FLUID FLOW IN A SPINNING AND NUTATING CYLINDER **c34**
T. Herbert *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 883-893 (For primary document see N86-14902 05-59)
(Contracts DAAG29-82-K-0129; DAAK11-83-K-0011)
(AD-P004955) Avail: NTIS HC A99/MF E03 CSCL 12/1

Spin-stabilized projectiles with liquid payloads can experience a severe flight instability characterized by a rapid yaw angle growth and a simultaneous loss in spin rate. Laboratory experiments and field tests have shown that this instability originates from the internal fluid motion in the range of high viscosity. Evaluation of the experimental data and analysis of the equations for the fluid motion in a spinning and nutating cylinder suggest a theoretical approach in three major steps: (1) analysis of the steady viscous flow in an infinitely long cylinder, (2) hydrodynamic stability analysis of this basic flow, and (3) analysis of the end effects. The basic flow has been found in analytical form. At low Reynolds number, this flow agrees well with computational results for the center section of a cylinder of aspect ratio 4.3. The despin moment caused by this flow largely agrees with experimental data for a wide range of Reynolds numbers. Current work aims at the stability of this flow. Author (GRA)

N86-14955# Army Concepts Analysis Agency, Bethesda, Md.
COMPUTING SETS **c67**
C. R. Leake *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 895-902 (For primary document see N86-14902 05-59)
(AD-P004956) Avail: NTIS HC A99/MF E03 CSCL 12/1

In large linear programming problems, rounding of type errors can cause problems. These errors stem from the computational set which is used by a computer. This article considers a case where it is shown that this set is commutative, contains additive and multiplicative inverses, is nonassociative, nondistributive with zero divisors. Two other sets which are quadratic extensions of a certain field that are nonassociative algebras with zero divisors are developed with an example of how these can be used to solve a differential equation of a certain form. GRA

N86-14956# Harry Diamond Labs., Adelphi, Md.
CALCULATION OF LOWER CONFIDENCE BOUNDS ON SYSTEM RELIABILITY **c38**
J. V. Michalowicz *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 903-937 (For primary document see N86-14902 05-59)
(AD-P004957) Avail: NTIS HC A99/MF E03 CSCL 12/1

A general methodology, based on algorithms developed by the Ad-Hoc Methodology Working Group on Nuclear Weapons Reliability Assessment, is described for evaluating 90% lower confidence bounds on system reliability for configurations of series/parallel circuits. General configurations of non-repeated and repeated components are examined and a method for unpooling data is discussed. A technique is derived for representing m out of n decision logic gates. The methodology is applied to an example of the type of a sophisticated weapon fuzing system. Maximum likelihood estimates of reliability and 90% lower confidence bounds are calculated for the system and critical components are identified. Author (GRA)

N86-14957# Texas A&M Univ., College Station. Dept. of Mathematics.
B-SPLINES ON NONUNIFORM TRIANGULATIONS **c64**
C. K. Chui *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 939-942 (For primary document see N86-14902 05-59)
(AD-P004958) Avail: NTIS HC A99/MF E03 CSCL 12/1

B-splines of lowest total degrees on triangulations of nonuniform rectangular partitions are considered. Several interesting properties are discovered for the type-one setting. In particular, there are B-splines, that is splines with minimum supports, whose supports are concave, and B-splines do not necessarily form a partition of unity. Author (GRA)

N86-14958# Rome Univ. (Italy). Dipt. di Fisica.
THE METHODOLOGICAL EVOLUTION OF PHYSICS RESEARCH CAUSED BY THE INTRODUCTION OF COMPUTERS [SU ALCUNI MUTAMENTI METODOLOGICI NELLA RICERCA IN FISICA INDOTTI DALL'ELABORATORE ELETTRONICO]
Roberto Livi (Florence Univ.), Stefano Ruffo (Osservatorio Astrofisico di Arcetri, Florence), Marco Pettini, and Angelo Vulpiani 6 Mar. 1985 40 p refs In ITALIAN
(Preprint-444) Avail: NTIS HC A03/MF A01

The history of computers in physics is reviewed pointing out the transformation of the computer in a mind laboratory where research is made on the thinking process itself. The epistemological changes include danger of justifying dangerous ideologies. Author (ESA)

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.

For components see *33 Electronics and Electrical Engineering.*

N86-14959*# National Aeronautics and Space Administration. Kennedy (John F.) Space Center, Cocoa Beach, Fla.
AUTOMATED SUPPORT REQUIREMENT SYSTEM USER'S GUIDE FOR NONDATA ENTRY PERSONNEL Final Report
John E. Maryland, Jr. 18 Mar. 1985 65 p
(NASA-TM-83097; KSC-GP60-1; NAS 1.15:83097) Avail: NTIS HC A04/MF A01 CSCL 09B

ASRS provides the capability to process intercenter/agency support requirements and commitments necessary for support of the Space Shuttle Launch and Landing, Flight, and Cargo operations. The instructions and commands that users will be allowed to utilize are presented. ASRS utilizes a data base stored on Honeywell DPS8 computer. ASRS programs are written in COBOL 74 utilizing the Honeywell DMIV-TP Processing System and the GCOS8 Operating System; they can also be accessed through Telenet or Datanet. Author

N86-14960# Southwest Research Inst., San Antonio, Tex.
DIGITAL SERVOCONTROLLER SYSTEM. VOLUME 1: OPERATIONS MANUAL Final Report, 6 Jul. 1983 - 6 Nov. 1984
J. Lopez and K. Miller Feb. 1985 48 p
(Contract F33615-83-C-3201)
(AD-A158392; SWRI-14-7676-060-Vol-1; AFWAL-TR-84-3117-Vol-1) Avail: NTIS HC A03/MF A01 CSCL 09/2

This final report describes an exploratory development effort for the design and fabrication of a digital servocontroller system for load control in full-scale air-frame fatigue tests. Each digital controller replaces four analog controllers. The LSI-11/23 microcomputer in the digital controller executes a PI algorithm to implement direct digital control. It may operate in a stand-alone mode or as a slave processor to a master computer via fiber optic link. Other programmable features specifying loop parameters, building load profiles, adjusting control system gains and monitoring alarm and abort conditions. GRA

N86-14961# Naval Surface Weapons Center, Dahlgren, Va.
MASS MEMORY STORAGE DEVICES FOR AN/SLQ-32(V) Final Technical Report
L. C. Triola 1 Jun. 1985 159 p
(AD-A158515; AD-F350038; NSWC/TR-85-133) Avail: NTIS HC A08/MF A01 CSCL 09/2

This technical report documents the investigation of mass memory storage devices for use with AN/SLQ-32(V) electronic warfare suites. The device is to be incorporated into the AN/SLQ-32(V) systems in order to reduce the program loading time and the operator actions required for the load. The report includes specific details on five types of mass memory storage devices: magnetic hard disks, optical (laser) disks, magnetic bubble memory, dynamic RAM with battery backup, and Bernoulli disk drives. GRA

N86-14962# Maryland Univ., College Park. Center for Automation Research.
ARC COLORINGS, PARTIAL PATH GROUPS, AND PARALLEL GRAPH CONTRACTIONS
A. Rosenfeld Jul. 1985 40 p
(Contract F49620-85-K-0009)
(AD-A158918; CAR-TR-132; CS-TR-1524; AFOSR-85-0718TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

This document defines an algebraic structure on the paths in a graph based on a coloring of the arcs. Using this structure, basic classes of graphs (trees, hypercubes, arrays, cliques, etc.) are characterized by simple algebraic properties. The structure provides a framework for defining parallel contraction operations on a graph, in which many pairs of nodes are simultaneously collapsed into single nodes, but the degree of the graph does not increase. Such operations are useful in defining systematic strategies for simulating large networks of processors by smaller ones, or in building pyramids of networks. Author (GRA)

N86-14963# Naval Postgraduate School, Monterey, Calif.
A DIGITAL RECORDING SYSTEM FOR SPACE-BASED APPLICATIONS UTILIZING FOUR-MEGABIT MAGNETIC BUBBLE MEMORIES M.S. Thesis
B. A. Campbell Jun. 1985 124 p
(AD-A159002) Avail: NTIS HC A06/MF A01 CSCL 14/3

Magnetic bubble memory technology offers several desirable characteristics for applications in space as a mass data recording and storage system. A modular combination of Intel Corp. state-of-the-art fourmegabit magnetic bubble memory components is presented which can be configured as a digital data recorder of variable capacity and input rate. GRA

N86-14964# Stanford Univ., Calif. Dept. of Computer Science.
LEARNING CONTROL HEURISTICS IN BB1
B. Hayes-Roth and M. Hewett 7 Jan. 1985 17 p
(Contract MDA903-83-C-0335)
(AD-A159199; SU-STAN-CS-85-1036; HPP-85-2) Avail: NTIS HC A02/MF A01 CSCL 09/2

BB1, a blackboard system building computer architecture, ameliorates the knowledge acquisition bottleneck with generic knowledge sources that learn control heuristics. Some learning knowledge sources replace the knowledge engineer, interacting directly with domain experts. Others operate autonomously. The paper presents a trace from the illustrative knowledge source, Understanding, Preference, running in PROTEAN, a blackboard system for elucidating protein structure. Understand-Preference is triggered when a domain expert overrides one of BB1's scheduling recommendations. It identifies and encodes the heuristic underlying the expert's scheduling decision. The trace illustrates how learning knowledge sources exploit BB1's rich representation of domain and control knowledge, actions, and results. Author (GRA)

N86-14965# Naval Postgraduate School, Monterey, Calif.
USE OF THE GPIB (GENERAL PURPOSE INTERFACE BUS) FOR DATA COLLECTION AND DISPLAY M.S. Thesis
T. Taylor Jun. 1985 75 p
(AD-A159475) Avail: NTIS HC A04/MF A01 CSCL 09/2

The objective of this thesis is to examine the uses of a General Purpose Interface bus (GPIB) to link a microcomputer controller to computer-controllable test equipment. The Hewlett-Packard HP-85 microcomputer is examined as the system controller. The test equipment is configured to conduct basic electronic laboratories and the results are compared with current manually-controlled test equipment. Test equipments evaluated include: The Wavetek Model 270 programmable function generator, Tektronix DC5009 programmable counter/timer, Tektronix DM5010 programmable digital multimeter, Tektronix PS5010 programmable logic analyzer, and the Photodyne Model 488XII GPIB interface with digital power meter. These equipments and others are evaluated singlely and in combination. Various methods for displaying and plotting acquired data are discussed and evaluated. Author (GRA)

N86-14966# Naval Postgraduate School, Monterey, Calif.
DESIGN, ANALYSIS AND IMPLEMENTATION OF THE PRIMARY OPERATION, RETRIEVE-COMMON, OF THE MULTI-BACKEND DATABASE SYSTEM (MBDS) M.S. Thesis
H. L. Tung Jun. 1985 149 p
(AD-A159476) Avail: NTIS HC A07/MF A01 CSCL 09/2

The multi-backend database system (MBDS) in the Laboratory for Database System Research at the Naval Postgraduate School is designed to overcome the performance-gain and capacity-growth problems of either the traditional database system or the single-backend-software database system. The original MBDS supported four primary operations, namely, RETRIEVE, DELETE, UPDATE AND INSERT. This thesis presents the design and implementation of the fifth primary operation, the RETRIEVE-COMMON operation. The retrieve-common operation is used to merge two files by their common attribute values. First, the overall design and implementation of MBDS is reviewed. Then, several alternatives are compared and analyzed to select the best one as our design and implementation approach. Finally, we describe the detailed design and the implementation. Our goal is to maximize the utilization and minimize the effects to the existing system. For integrating our design into MBDS, several modifications are made. The algorithms for the modifications and their program specifications are also provided in Chapter 4, 5 and Appendices. Author (GRA)

N86-14967# Naval Postgraduate School, Monterey, Calif.
THE DESIGN AND IMPLEMENTATION OF A RELATIONAL INTERFACE FOR THE MULTILINGUAL DATABASE SYSTEM M.S. Thesis
G. R. Kloepping and J. F. Mack Jun. 1985 184 p
(AD-A159509) Avail: NTIS HC A09/MF A01 CSCL 09/2

Traditionally, the design and implementation of a conventional database system begins and ends with the choice of a data model followed by the specification of a model-based data language. Thus, the database system is restricted to a single data model and a specific data language. An alternative to this traditional approach to database-system development is the multi-lingual database system (MLDS). This alternative approach enables the user to access and manage a large collection of databased via

several data models and their corresponding data languages without the aforementioned restiction. This thesis presents the specification and implementation of a relational/SQl language interface for the MLDS. Specifically, it presents the specification and implementation of an interface which translates SQL language calls into attribute-based language requests. We describe the software engineering aspects of our implementation and an overview of the four modules which comprise our relational/SQL language interface. GRA

N86-14968# Naval Postgraduate School, Monterey, Calif.
THE DESIGN AND IMPLEMENTATION OF A HIERARCHICAL INTERFACE FOR THE MULTILINGUAL DATABASE SYSTEM M.S. Thesis
T. P. Benson and G. L. Wentz Jun. 1985 205 p
(AD-A159542) Avail: NTIS HC A10/MF A01 CSCL 09/2

Traditionally, the design and implementation of a conventional data base system begins with the selection of a data model, followed by the specification of a model-based data language. An alternative to this traditional approach to database system developement is the multilingual database system. This alternative approach affords the user the ability to access and manage a large collection of data bases via several data models and their corresponding data languages. This thesis presents the specification and implementation of a hierarchical/DL/I language interface for the MLDS. Specificallly, it presents the specification and implementation of an interface which translate DL/I data language calls into attribute-based data language requests. The author describes the software engineerig aspects of the implementation and an overview of the four modules which comprise the DL/I language interface. Author (GRA)

N86-14969# Oak Ridge National Lab., Tenn.
SUPERCOMPUTERS IN SUBSURFACE TRANSPORT RESEARCH: HYDROGEOCHEM ON THE HYPERCUBE COMPUTER
V. S. Tripathi and G. T. Yeh 1985 4 p refs Presented at Hydrological Applications of Supercomputers - Future Directions, West Lafayette, Ind., 10 Sep. 1985
(Contract DE-AC05-84OR-21400)
(DE85-016148; CONF-850912-1) Avail: NTIS HC A02/MF A01

Hydrologic, geochemical, and coupled hydrologic-geochemical models serve as tools for testing various hypotheses about the underlying processes at laboratory and field scales and for identifying questions which must be addressed for making fundamental advances. HYDROGEOCHEM was developed by interfacing FEMA, a finite-element transport model, with MINWQL and CHEMEQUIL, which are chemical equilibrium models. The iterative-solution algorithm in FEMA provides significantly faster execution speeds and decreased storage requirements in comparison with direct solution methods, and CHEMEQUIL offers substantial reduction in CPU time and storage requirements over MINEQL and similar programs. Error-propagation schemes are being incorporated in the chemical module of HYDROGEOCHEM. DOE

N86-14970# Martin Marietta Energy Systems, Inc., Oak Ridge, Tenn.
COMPUTER-AIDED ENGINEERING VERTICAL INTEGRATION: A USER'S PERSPECTIVE
T. C. Domm, J. Blackerby, G. A. Byington, K. K. Chipley, W. H. Gray, D. P. Kuban, D. H. Vnadergriff, and D. H. Williamson Aug. 1985 91 p
(Contract DE-AC05-84OT-21400)
(DE85-017244; K/D-5645) Avail: NTIS HC A05/MF A01

Vertical integration is defined as the linking of sequential computer-aided engineering (CAE) functions by means of a common data base, creating a design process that spans a spectrum of CAE activities. The need for vertical integration is established, and the existing software and hardware environment available to engineering is examined. Vertical integration between the various CAE functions is demonstrated, and the process, capabilities and limitations are described. Data from this report were presented at the Symposium on Integration in Computer Aided Engineering and Manufacturing Systems on March 7, 1985. Copies of the presentation view graphs are included as Appendix A. DOE

N86-14971# Olympia Werke A.G., Wilhelmshaven (West Germany). Grundlagenforschung.
WORD IMAGE PRINTER USING THE INK JET PROCESS Final Report, Jun. 1983
Norbert Zeising Bonn Bundesministerium fuer Forschung und Technologie Jun. 1985 122 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-85-056; ISSN-0340-7608) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 25.50

A word/image printer was developed to allow the printing of document files including test and image elements on blank paper to be performed in a single operation and with letter graphic quality. The applicability of the printer is studied to meet the user's ergonomic requirements. The print head operates on the drop-on-demand principle and forms a dot matrix with a density of 8 dots per min. The ink printing system is adapted regarding dot density and risk type to allow alphanumeric characters. Coded document files and encoded picture file are linked by boolean functions on the bitmap memory. Applicability of the word image printing system on blank paper is demonstrated with samples. Author (ESA)

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N86-14972* Martin Marietta Aerospace, Denver, Colo.
MODEL REDUCTION TECHNIQUE FOR USE WITH THE DYNAMIC INTERACTION SIMULATION CONTROLS AND STRUCTURES (DISCOS) COMPUTER PROGRAM Final Report
R. N. Gehling Feb. 1985 94 p refs
(Contract NAS5-27701)
(NASA-CR-175314; NAS 1.26:175314; MCR-85-534) Avail: Issuing Activity CSCL 09B

DISCOS is the most general purpose multibody program available for investigation of complex dynamic problems. A major task facing the potential DISCOS user is the preparation and incorporation of flexible body dynamic characterisics into the input data stream. The DISCOS program and the NASAM program were converted to the DEC-VAX system. DISCOS and the GSFC modal preprocessor of NASTRAN flexible body data were verified through use of sample problems. During this verification procedure discrepancies were found in the DISCOS program. These discrepancies are discussed and modifications to the subject subroutines are noted. An evaluation of various modal synthesis methods and truncation guidelines together with recommendations is given. Volume 2, Supporting Data, contains analytical models of the sample problems, generation of input program data and results of the studies. Author

N86-14973# Ballistic Research Labs., Aberdeen Proving Ground, Md.
COMPUTER IMPLEMENTATION OF A MUZZLE BLAST PREDICTION TECHNIQUE Final Report
C. W. Heaps, K. S. Fansler, and E. M. Schmidt May 1985 82 p
(DA Proj. 1L1-61102-AH-43)
(AD-A158344; BRL-MR-3443) Avail: NTIS HC A05/MF A01 CSCL 19/4

A computer code is developed which generates contour maps of peak incident overpressure, peak reflected overpressure, blast wave time of arrival, and blast wave positive phase duration. The code is based upon a free field muzzle blast scaling technique which is extended to treat blast wave reflection from surfaces. The predictions of the code are shown to compare reasonably well with experiment. GRA

N86-14974# Air Force Logistics Command, Wright-Patterson AFB, Ohio.
NETWORK REPAIR LEVEL ANALYSIS MODEL: USER'S GUIDE
L. Briskin Jul. 1985 113 p
(AD-A158433) Avail: NTIS HC A06/MF A01 CSCL 15/5

Repair levels analysis (RLA) is the general process of determining whether components of weapons systems or other systems should be repaired or scrapped and, if repaired, where repaired. This user's guide describes a model for determining repair level decisions by considering life cycle maintenance related costs. The model formulates the repair level decision problem as a network analysis problem. This approach was chosen because it explicitly considers the indenture level relationships between items (Line Replaceable Units (LRUs) and Shop Replaceable Units (SRUs)), and considers support equipment as a resource shared by a group of items. Although the decision problem is formulated as a cost network it is not necessary for the user to construct the network or manually solve it. This is done by the computer program written for the model. GRA

N86-14975# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Psychology.
FERMI: A FLEXIBLE EXPERT REASONER WITH MULTI-DOMAIN INFERENCING Technical Report, 1982 - 1986
J. H. Larkin, F. Reif, J. Carbonell, and A. Gugliotta 29 Jul. 1985 81 p
(Contract N00014-82-C-0767)
(AD-A158476) Avail: NTIS HC A05/MF A01 CSCL 09/2

Expert reasoning combines voluminous domain-specific knowledge with more general factual and strategic knowledge. Whereas expert system builders have recognized the need for specificity and problem-solving researchers the need for generality, few attempts have been made to develop expert reasoning engines combining different kinds of knowledge at different levels of generality. This paper reports on the FERMI project, a computer-implemented expert reasoner in the natural sciences that encodes factual and strategic knowledge in separate semantic hierarchies. The principled decomposition of knowledge according to type and level of specificity yields both power and cross-domain generality, as demonstrated in FERMI's ability to apply the same principles of invariance and decomposition to solve problems in fluid statics. DC-circuits, and centroid location. Hierarchical knowledge representation and problem-solving principles are discussed, and illustrative problem solving traces are presented. Author (GRA)

N86-14976# Naval Postgraduate School, Monterey, Calif.
STOP AND LOOK DETECTION ALGORITHM
A. F. Andrus May 1985 29 p
(AD-A158541; NPS55-85-011) Avail: NTIS HC A03/MF A01 CSCL 09/2

The Stop and Look Detection Algorithm is a procedure for computing the cumulative probability of detection as a function of time for a searcher looking discretely for an evading target. The assumptions required for computation are: target detection is deterministic, i.e., cookie cutter, the target leaves datum on a random fixed course at constant velocity, the searcher travels at constant velocity and the searcher stops and looks for the target leaves datum on a random fixed course at constant velocity, the searcher travels at constant velocity and the searcher stops and looks for the target at predetermined search points. This report contains a description of the algorithm, the IBM-PC BASIC Program for cmputation and several examples. Author (GRA)

N86-14977# California Univ., Irvine. Dept. of Information and Computer Science.
APPROACHES TO CONCEPTUAL CLUSTERING Interim Report, Jan. - Jun. 1985
D. Fisher and P. Langley 12 Jul. 1985 19 p
(Contract N00014-84-K-0345)
(AD-A158728; UCI-ICS-85-17; TR-1) Avail: NTIS HC A02/MF A01 CSCL 09/4

Methods for Conceptual Clustering may be explicated in two lights. Conceptual Clustering methods may be viewed as extensions to techniques of numerical taxonomy, a collection of methods developed by social and natural scientists for creating classification schemes over object sets. Alternatively, conceptual clustering may be viewed as a form of learning by observation or concept formation, as opposed to methods of learning from examples or concept identification. This paper surveys and compares a number of conceptual clustering methods along dimensions suggested by each of these views. The point the authors most wish to clarify is that conceptual clustering processes can be explicated as being composed of three distinct but inter-dependent subprocesses: the process of deriving a hierarchical classification scheme; the process of aggregating objects into individual classes; and the process of aggregating objects into individual classes; and the process of assigning conceptual descriptions to object classes. Each subprocess may be characterized along a number of dimensions related to search, thus facilitating a better understanding of the conceptual clustering process as a whole. Author (GRA)

N86-14978# Maryland Univ., College Park.
PARALLEL IMAGE PROCESSING AND IMAGE UNDERSTANDING Final Report, 1 Sep. 1984 - 1 Apr. 1985
A. Rosenfeld 5 Jul. 1985 9 p
(Contract F49620-83-C-0082)
(AD-A159029; AFOSR-85-0645TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

This report summarizes research conducted during the period May 1983 to April 1985. Abstracts of 20 reports are given in chronological order. This bibliography deals with the following topics: (1) Parallel algorithms and architectures for processing images and data structures derived from images; (2) Interprocessor communication for parallel processing; (3) Knowledge-based image understanding; and, (4) Image modeling. Author (GRA)

N86-14979# Texas Univ., Austin. Dept. of Computer Sciences.
RESEARCH TO STUDY SPECIFIC, IMPORTANT PROBLEMS IN DISTRIBUTED SYSTEMS AND PROPOSE SOLUTIONS FOR THEM Final Report, 14 Jun. 1981 - 15 Jun. 1985
K. M. Chandy and J. Misra Jul. 1985 174 p
(Grant AF-AFOSR-0205-81)
(AD-A159189; AFOSR-85-0732TR) Avail: NTIS HC A08/MF A01 CSCL 09/2

Work has resulted in a number of significant algorithms for distributed systems. Notable among these are: (1) Distributed Snapshots: which allows for the construction of a consistent global state, (2) The Drinking Philosophers Problem: which captures the essence of many conflict resolution problems, (3) Detection of Quiescent Properties: which allows detection of many stable properties without taking a snapshot, and (4) Distributed Search: which allows for the solution of dynamic programming problems on a message passing architecture. Author (GRA)

N86-14980# SRI International Corp., Menlo Park, Calif. Computer Science Lab.
OPTIMAL STRUCTURES FOR MULTIMEDIA INSTRUCTION Final Report, 19 Aug. 1982 - 31 Aug. 1985
J. Goguen, C. Linde, and T. K. Bikson Jul. 1985 73 p
(Contract N00014-82-K-0711)
(AD-A159205) Avail: NTIS HC A04/MF A01 CSCL 09/2

This final report presents the results of a two-year study of the structure of multimedia instruction. The real-world problem that has inspired this research is how to design effective multimedia instructional materials. In designing instructional materials for such media, one should use theoretically motivated and experimentally verified principles for choosing among the many possible instructional structures and representations possible using the various media involved. This report presents research aimed at exploring some basic principles of this kind. The major findings include the following: Choice of discourse type can strongly affect comprehension; this is a new result that would not have been predicted by any current theory of instruction or comprehension; Gestural coordination between visual and verbal material can significantly help comprehension; Suitable vision icons can greatly aid compre-

hension, even when they are not coordinated with linguistic material; Cognitive level has a very significant and systematic effect on comprehension; Manipulation of the internal structure of discourse units has significant and systematic effects; in particular, the greater the level of structure violated, the greater seems to be its effect on comprehension. To discover this effect requires a relatively fine-grained theory of discourse structure; and Inclusion of summaries, particularly initial summaries, seems to assist comprehension. GRA

N86-14981# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
STATISTICAL ANALYSIS OF ENERGETIC ELECTRONS (3.4-16 MeV) AT GEOSYNCHRONOUS ALTITUDE AND THEIR RELATIONSHIP TO INTERPLANETARY PARAMETERS M.S. Thesis
W. L. Smith Dec. 1983 110 p
(AD-A159217; AFIT/GSO/PH/83D-3) Avail: NTIS HC A06/MF A01 CSCL 03/2

This analysis attempted to examine the relationship between energetic electrons in the magnetosphere between the energy levels of 3.4-16 MeV, solar wind speed, and the Bz component of the Interplanetary Magnetic Field (IMF). The statistical analysis was accomplished using the SPSS computerized package and data from DOD spacecraft 1979-053 at geosynchronous altitude. The electron flux data from this satellite was compared statistically with IMF and solar wind plasma data measured by other spacecraft located in the solar wind stream. Analytic techniques used included graphical plotting, descriptive statistics, scatter plots, correlation analysis, and analysis of variance (ANOVA) tests. This statistical analysis of energetic electrons at geosynchronous altitude and their relationship to solar wind speed and the IMF Bz component resulted in different findings for electron flux above and below approximately 6.6 MeV energy level. There was a weak, positive correlation between electron flux in the energy ranges 3.4 - 4.9 and 4.9 - 6.6 MeV and values of solar wind speed, after two days passage. GRA

N86-14982# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
THE INTERACTIVE GENERATION OF ALPHANUMERICS AND SYMBOLOGY WITH DESIGNS ON THE FUTURE M.S. Thesis
K. A. Adams Jun. 1985 237 p Original contains color illustrations
(AD-A159218; AFIT/GCS/MA/85J-2) Avail: NTIS HC A11/MF A01 CSCL 09/2

This thesis investigated the available methods for implementing human-computer interfaces using sophisticated graphics systems, with the goal of designing and implementing an advanced graphics development environment. Such a developmental laboratory is necessary to support current and futuristic crew station design for display-oriented cockpits. The result of this effort was the development system DESIGNS. The DESIGNS software system was tailored specifically for real-time, pilot-in-the-loop, research and development simulation. Critical features of such a system include fast turn-around time, and the capability to expand as enhanced tools are developed. The resulting system supports interactive development of heads-up and heads-down display symbology. It generates correct display formatting information for multiple target graphics devices. Future enhancements include rehosting to a more powerful workstation, preferably in Ada, and continued addition of graphics development tools supporting simulation needs. GRA

N86-14983# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
AN APPROACH TO AUTOMATIC ROBOT PROGRAMMING
T. Lozano-Perez and R. A. Brooks Apr. 1985 37 p
(Contracts N00014-81-K-0494; N00014-80-C-0505; N00014-82-K-0334)
(AD-A159296; AD-F250300; AI-M-842) Avail: NTIS HC A03/MF A01 CSCL 09/2

This paper proposes a computer architecture for a new task-level system, which is called TWAIN. Task-level programming attempts to simplify the robot programming process by requiring that the user specify only goals for the physical relationships among objects, rather than the motions needed to achieve those goals. A task-level specification is meant to be completely robot independent; no positions or paths that depend on the robot geometry or kinematics are specified by the user. There are two goals for this paper. The first is to present a more unified treatment of some individual pieces of research in task planning, whose relationship has not previously been described. The second is to provide a new framework for further research in task-planning.
Author (GRA)

N86-14984# Massachusetts Inst. of Tech., Cambridge. Lab. for Computer Science.
A MIXED-INTEGER LINEAR PROGRAMMING PROBLEM WHICH IS EFFICIENTLY SOLVABLE Interim Research Report
C. E. Leiserson and J. B. Saxe Jul. 1985 16 p
(Contracts N00014-80-C-0622; N00014-76-C-0370)
(AD-A159496; MIT/LCS/TM-284) Avail: NTIS HC A02/MF A01 CSCL 12/1

Much research has centered on the problem of finding shortest paths in graphs. It is well known that there is a direct correspondence between the single-source shortest-paths problem and the following simple linear programming problem. Let S be a set of linear inequalities of the form x sub j - x sub i < or - a sub ij, where the x sub i are unknowns and the a sub ij are given real constants. Determine a set of values for the x sub i such that the inequalities in S are satisfied, or determine that no such values exist. This paper considers the mixed-integer linear programming variant of this problem in which some (but not necessarily all) of the x sub i are required to be integers. The problem arises in the context of synchronous circuit optimization, but it has applications to PERT scheduling and VLSI layout compaction as well. GRA

N86-14985# Argonne National Lab., Ill.
SYSTEMS ANALYSIS LANGUAGE TRANSLATOR (SALT): USER'S GUIDE
H. K. Geyer and G. F. Berry Jan. 1985 148 p refs
(Contract W-31-109-eng-38)
(DE85-015591; ANL/FE-85-3) Avail: NTIS HC A07/MF A01

The Systems Analysis Language Translator (SALT), a systems-analysis and process-simulation computer code for steady-state and dynamic systems, can also be used for optimization and sensitivity studies. The SALT code uses sophisticated numerical techniques, including a hybrid steepest-descent/quasi-Newtonian multidimensional nonlinear equation solver, sequential quadratic programming methods as optimizers, and multistep integration methods for both stiff and nonstiff systems of equations. Based on a preprocessor concept, the code uses a language translator to allow the user great flexibility in specifying a systems-analysis problem using a mostly free format and user-defined labels. The code uses precompiled component models, several flow types, and numerous thermodynamic and transport property routines, including a gas chemical-equilibrium code. The SALT code has been used to study open-cycle and liquid-metal magnetohydrodynamic systems, fuel cells, ocean thermal energy conversion, municipal-solid-waste processing, fusion, breeder reactors, and geothermal and solar-energy systems. DOE

N86-14986# Fermi National Accelerator Lab., Batavia, Ill.
EPICS COOKBOOK: A BARE BONES START
R. Zamin Aug. 1985 19 p
(Contract DE-AC02-76CH-03000)
(DE85-017672; FNAL-TM-1342) Avail: NTIS HC A02/MF A01

This booklet is a simple operator's guide to the EPICS system. It was created for the novice operator. Examples are given for each procedure. B.W.

N86-14987# General Electric Co., Largo, Fla. Neutron Devices Dept.
CADCAM INTEGRATION: TEST DATA AND PRODUCT DEFINITION DATA EXCHANGE, PILOT PROJECT NOS. 4 AND 5

V. L. McCauley 19 Jun. 1985 39 p
(Contract DE-AC04-76DP-00656)
(DE85-014848; GEPP-TM-904) Avail: NTIS HC A03/MF A01

Computer Aided Design/Computer Aided Manufacturing (CAD/CAM) integration in the Department of Energy Nuclear Weapons Complex (DOE NWC) requires automating the transfer of data. Two pilot projects were established to initiate meaningful electronic, graphic, and alpha-number data exchange between Sandia National Laboratories, Albuquerque (SNLA), and the General Electric Neutron Devices Department (GEND), and to test the available communication paths. The two projects are described herein and are Pilot Project No. 4, Design Definition Phase, and Pilot Project No. 5, Test Data Phase. A description of the project objectives, the approach used, evaluation criteria, specific issues, and conclusions are given for each project. DOE

N86-14988# Sandia National Labs., Albuquerque, N. Mex.
SELECTED SOFTWARE OF SANDIA NATIONAL LABORATORIES
R. E. Jones, ed. and R. P. Stromberg, ed. Jul. 1985 28 p
(Contract DE-AC04-76DP-00789)
(DE85-016520; SAND-85-0904) Avail: NTIS HC A03/MF A01

Brief descriptions of a number of computer programs developed at Sandia National Laboratories which are available to the public are given. Most of these programs are scientific in nature. The programs are grouped into nine general categories to assist the reader, and a contact person is listed for each program. DOE

N86-14989# Los Alamos National Lab., N. Mex.
CONPAR: A CONSTRAINED PARAMETRIC SURFACE 3D GRAPHICS PROGRAM
J. Ferguson Jun. 1985 64 p
(Contract W-7405-eng-36)
(DE85-016210; LA-10441-MS) Avail: NTIS HC A04/MF A01

The CONPAR defines a set of polygons approximating a collection of mathematically constrained surfaces and is used with the MOVIE program to create three-dimensional hidden-line/surface plots. Constraints are certain Boolean combinations of half-space including plane, ellipsoid, sphere, cone, cylinder, and torus-bounded regions. Surfaces for display include the above region boundaries as well as B-spline surfaces. Surface and constraint types are easily extended to include other mathematical varieties. DOE

N86-14990# Stanford Univ., Calif. Systems Optimization Lab.
SPARSE QUASI-NEWTON METHODS AND THE CONTINUATION PROBLEM
F. F. Chadee Jun. 1985 133 p
(Contract DE-AS03-76ER-72018)
(DE85-015390; SU-SOL-85-8) Avail: NTIS HC A07/MF A01

The problem of tracing a smooth path arises in many engineering problems, the solution of parametric differential equations and eigenvalue problems; it also finds application in the solution of nonlinear systems of equations by homotopy techniques. In many instances, the path is defined implicitly as the solution of a system of equations whose Jacobian matrix is large and sparse. Robust simplicial path-following techniques cannot be applied to large problems since the work involved rises rapidly with increasing dimension. This dissertation addresses the numerical problems involved in tracing the path for large sparse systems by the use of a predictor-corrector algorithm. The corrector phase of a predictor-corrector algorithm is very expensive if Newton's method is used as the corrector. We investigate the use of sparse quasi-Newton techniques to reduce this expense. In order to avoid the drawbacks of the sparse Broyden method the need for a matrix factorization on each iterate and the need to store the Jacobian matrix and its factors we examine techniques for directly updating the LU factors of the approximation to the Jacobian matrix. Under resonable assumptions on the systems of equations to be solved, a proof of local Q-superlinear convergence is presented for two sparse updating techniques. A predictor-corrector algorithm employing these sparse updating techniques is implemented in a FORTRAN code and numerical results are obtained demonstrating the advantages to be gained from the use of quasi-Newton methods for the large sparse continuation problem. DOE

N86-14991# Oak Ridge National Lab., Tenn.
FORTH IMPLEMENTATION OF THE HEAP DATA STRUCTURE FOR MEMORY MANAGEMENT
W. B. Dress 1985 23 p Presented at the 4th Rochester Conference, Rochester, N.Y., 12 Jun. 1985
(Contract DE-AC05-87OR-21400)
(DE85-017089; CONF-8506181-1) Avail: NTIS HC A02/MF A01

The use of the heap for memory management provides the FORTH programmer with a versatile tool. Its use speeds program development at the conceptual level by allowing the program designer to consider dynamic arrays, garbage collection, and overlays; and at the implementation stage by providing a framework for easy manipulation of such data structures. An examination of the high-level codes leads naturally to examples of these and other techniques of dynamic data management. DOE

N86-14992# Los Alamos National Lab., N. Mex.
INFORMATION-THEORETIC MODEL OF THE PROGRAMMING PROCESS
N. S. Coulter 1985 22 p Presented at the National Computer Conference, Chicago, 22 Jul. 1985 Prepared in cooperation with Florida Atlantic Univ., Boca Raton
(Contract W-7405-eng-36)
(DE85-002419; LA-UR-84-3370; CONF-850709-1) Avail: NTIS HC A02/MF A01

Aspects of computer programming activities have been modeled by numerous researchers. The model presented here is based on an information-theoretic description that provides a unified formalization of the programming process from specification through implementation. The concept of an algorithm's problem pace is developed, and the complexity of an algorithm is defined in terms of its associated variables and their values. An algorithm's complexity is derived from the declaration section of the resulting program. Because a program's declarations are derivable before the program body is implemented, a program's complexity can be estimated before it is completed. This model provides insight into the comparative complexities of problem spaces and suggests ways of subdividing those problem spaces and their associated programs. DOE

N86-14993# Stanford Linear Accelerator Center, Calif.
GIANT: A COMPUTER CODE FOR GENERAL INTERACTIVE ANALYSIS OF TRAJECTORIES
J. Jaeger, M. Lee, R. Servranckx, and H. Shoaee Apr. 1985 3 p Presented at the Particle Accelerator Conference, Vancouver, British Columbia, 13 May 1985
(Contract DE-AC03-76SF-00515)
(DE85-013058; SU-SLAC-PUB-3632; CONF-850504-106) Avail: NTIS HC A02/MF A01

Many model-driven diagnostic and correction procedures have been developed at SLAC for the on-line computer controlled operation of SPEAR, PEP, the LINAC, and the electron damping ring. In order to facilitate future applications and enhancements, these procedures are being collected into a single program, GIANT. The program allows interactive diagnosis as well as performance optimization of any beam transport line or circular machine. The test systems for GIANT are those of the sLC project. The organization of this program and some of the recent applications of the procedures will be described in this paper. DOE

N86-14994# Lawrence Livermore National Lab., Calif.
PATTERN GENERATION ON CADDS/2
D. M. Anderson May 1985 14 p Presented at the 7th Ann. Intern. Computervision Conference, Anaheim, Calif., 1 Sep. 1985
(Contract W-7405-eng-48)
(DE85-013206; UCRL-92777; CONF-850994-1) Avail: NTIS HC A02/MF A01

The crucial progression from CAE/CAD integrated circuit and microstructure design to photolithography can be accomplished through the ultilization of an assortment of pattern generation

formats available on CADDS/2. The most critical part of the lithographic process is the conversion of the layout pattern into a master mask. This vital link between circuit design and fabrication of the wafer is accomplished at Lawrence Livermore National Labs by the CADDS/2 System. Due to minute geometries in microelectronics, CAD interface is essential. Means for determining whether Electron Beam or Optical formats should be implemented to produce optimally fractured files, as well as the manipulation of either the design file or the pattern generation formats to provide increased versatility for lithography and wafer fabrication are discussed. DOE

N86-14995# Centre Technique des Industries Mecaniques, Senlis (France).
ADAPTATION OF THE CONTACT MODULE IN CASTOR TWO DIMENSIONAL SOFTWARE Final Report [PASSAGE DU MODULE DE CONTACT SOUS CASTOR-2D]
D. Grolade Feb. 1985 53 p refs In FRENCH
(CETIM-11-L-210) Avail: NTIS HC A04/MF A01

A finite element procedure to model solid-solid contact, as encountered in mechanical engineering, is described. The method assumes a fictitious material, the contact material. The option EVP ZD of the CASTOR software, used for thermoelastic-viscoplastic problems is adapted to two dimensional solid contacts with low deformation and elastic behavior. The contact algorithm allows for several types of contact: adhesion, gliding, friction. The solution is iterative and the cost in machine time can be high.
Author (ESA)

N86-14996# Societe Nationale Industrielle Aerospatiale, Paris (France).
STUDY OF THE APPLICABILITY OF HIGH LANGUAGES FOR ON-BOARD SATELLITES SOFTWARE PRODUCTION Final Report
Martin, B. duPlessis, and P. Vielcanet Paris ESA 1985 275 p Prepared in cooperation with Electronique Serge Dassault and Informatique Internationale
(Contract ESTEC-5614/83/NL-BI)
(ESA-CR(P)-2031) Avail: NTIS HC A12/MF A01

The Ada, LTR3, MODULA 2, HAL/S, C, and PASCAL high level languages were assessed for on board satellite software production. In the short term, no language appears suitable, although MODULA 2 is the most promising candidate. Ada is recommended for mid-term applications (end of 1990's).
Author (ESA)

N86-14997# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abt. Trans-Ueberschall-Entwurfsverfahren.
PROGRESS IN THE DEVELOPMENT OF AN EFFICIENT FINITE VOLUME CODE FOR THE THREE-DIMENSIONAL EULER EQUATIONS
Rolf Radespiel and Norbert Kroll Apr. 1985 43 p refs
(DFVLR-FB-85-31; ISSN-0171-1342) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 14

A computational procedure, termed CATS, for solving the three-dimensional Euler equations was developed using a finite volume spatial discretization and Runge-Kutta time stepping scheme. The numerical procedure is outlined, emphasizing the treatment of boundary conditions. A block-structured computer code for the CRAY-1S vector computer was developed. The logic for the treatment of boundary conditions provides a high flexibility of the code with respect to grid topology. Subsonic and transonic flows around the ONERA M6 wing were calculated. The results confirm the accuracy of the code. Author (ESA)

N86-14998# National Aerospace Lab., Amsterdam (Netherlands). Computing Center.
THE DELFT IMAGE ANALYSIS LABORATORY. A MULTI-USER FACILITY FOR RESEARCH, DEVELOPMENT AND EDUCATION IN IMAGE ANALYSIS METHODS
R. P. W. Duin (Technische Hogeschool, Delft) and F. A. Gerritsen 22 Apr. 1984 31 p refs Submitted for publication
(NLR-MP-84017-U; B8566271) Avail: NTIS HC A03/MF A01

Hardware and software of the Delft Image Analysis Laboratory are described. The research character of the system's use entails the sharply contrasting requirements of fast processing and flexible programming. By using the custom-developed pipelined DIP-1 image processor, all basic image-processing operations can be performed rapidly (most operations only need a fraction of a second). Other dedicated image-processing computers will supplement DIP-1's computing power. The required programming flexibility is catered for by a custom-developed software system, while interactive use is facilitated by a custom-developed image-processing command language interpreter. Author (ESA)

N86-14440# Joint Publications Research Service, Arlington, Va.
COMPUTER-AIDED DESIGN OF CAMS
Fengchi Zhang *In its* China Report: Science and Technology (JPRS-CST-85-033) 30 Sep. 1985 p 71-76 Transl. into ENGLISH from Dianzi Jishu Yingyong (Beijing), no. 12, 25 Dec. 1984 p 5-7 (For primary document see N86-14438 05-31)
Avail: NTIS HC A06/MF A01

N86-14469*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
COMPARISON OF GSFC AND JPL VLBI MODELING SOFTWARE: BENCHMARK
O. J. Sovers and C. Ma (NASA. Goddard Space Flight Center) *In its* The Telecommunications and Data Acquisition Report 15 Nov. 1985 p 101-112 refs (For primary document see N86-14457 05-32)
Avail: NTIS HC A10/MF A01 CSCL 09B

N86-14903# Columbia Univ., New York. Dept. of Mechanical Engineering.
COMPUTER-AIDED MECHANISMS ANALYSIS AND DESIGN
F. Freudenstein *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 1-12 (For primary document see N86-14902 05-59)
(AD-P004902) Avail: NTIS HC A99/MF E03 CSCL 13/9

N86-14907# Ballistic Research Labs., Aberdeen Proving Ground, Md.
PROGRAMMING WITH BINARY RELATIONS AND AN ASSOCIATED ALGEBRA OF PROGRAMS
P. Broome *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 61-74 (For primary document see N86-14902 05-59)
(AD-P004906) Avail: NTIS HC A99/MF E03 CSCL 12/1

N86-14909# General Electric Co., Schenectady, N. Y.
APPLICATION OF MACSYMA TO KINEMATICS AND MECHANICAL SYSTEMS
M. A. Hussain and B. Noble *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 85-103 (For primary document see N86-14902 05-59)
(AD-P004908) Avail: NTIS HC A99/MF E03 CSCL 12/1

N86-14911# Wisconsin Univ., Madison. Mathematics Research Center.
AN INTRODUCTION TO THE SCIENTIFIC COMPUTING LANGUAGE PASCAL-SC
L. B. Rall *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 117-148 (For primary document see N86-14902 05-59)
(Contract DAAG29-80-C-0041)
(AD-P004910) Avail: NTIS HC A99/MF E03 CSCL 09/2

N86-15177*# Houston Univ., Clear Lake, Tex.
SOME KEY CONSIDERATIONS IN EVOLVING A COMPUTER SYSTEM AND SOFTWARE ENGINEERING SUPPORT ENVIRONMENT FOR THE SPACE STATION PROGRAM
Charles W. McKay and Rodney L. Bown *In* NASA. Johnson (Lyndon B.) Space Center R and D Productivity: New Challenges for the US Space Program 1985 p 221-230 refs (For primary

document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 09B

N86-15180*# National Aeronautics and Space Administration. Johnson (Lyndon B.) Space Center,
SOFTWARE PRODUCTIVITY IMPROVEMENT THROUGH SOFTWARE ENGINEERING TECHNOLOGY
Frank E. McGarry *In* NASA. Johnson (Lyndon B.) Space Center R and D Productivity: New Challenges for the US Space Program 1985 p 249-263 refs (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 09B

N86-15200*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.
INCREASING PRODUCTIVITY OF THE MCAUTO CAD/CAE SYSTEM BY USER-SPECIFIC APPLICATIONS PROGRAMMING
Susan M. Piotrowski and Tom H. Vu *In* NASA. Johnson (Lyndon B.) Space Center R and D Productivity: New Challenges for the US Space Program 1985 p 481-488 refs (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 09B

62 COMPUTER SYSTEMS

Includes computer networks.

N86-14999# Auburn Univ., Ala. Engineering Experiment Station.
HARDWARE ACQUISITION FOR THE ENHANCEMENT OF A FAULT TOLERANCE/DISTRIBUTED COMPUTING LABORATORY Final Report, 15 May 1982 - 14 May 1985
V. P. Nelson 7 Aug. 1985 11 p
(Grant DAAG29-82-G-0006)
(AD-A158439; AU-EE-85-0006-1; ARO-18964.1-EL-EQ) Avail: NTIS HC A02/MF A01 CSCL 09/2

The Fault Tolerance/Distributed Computing Laboratory (FTDCL) at Auburn University is a facility developed under the sponsorship of the U.S. Army Ballistic Missile Defense Advanced Technology Center (BMDATC) for the purpose of conducting experiments to test and evaluate various candidate fault tolerance techniques for use in multiprocessor computer systems which may be employed for Ballistic Missile Defense (BMD). The FTDCL is unique in that it's structure can be modified as needed to support various hardware-oriented approaches to fault multiprocessor design. This cannot easily be done at other BMDATC testbeds, since the structures of these systems must remain fixed to support a variety of users on a daily basis. The FTDCL facility consists of a tightly-coupled multiprocessor, currently constructed around four single-board computers, four shareable memory modules and an experimental shuffle/exchange interconnection network. The processors in this system work in parallel on various tasks within an overall problem, cooperating by exchanging and sharing data through the common memory. GRA

N86-15000# KMS Fusion, Inc., Ann Arbor, Mich.
PARALLEL PROCESSING FOR COMPUTATIONAL CONTINUUM DYNAMICS Final Report, 15 Sep. 1984 - 15 Mar. 1985
J. F. McGrath 10 May 1985 44 p
(Contract F49620-84-C-0111)
(AD-A158948; AFOSR-85-0670TR) Avail: NTIS HC A03/MF A01 CSCL 09/2

The numerical solution of many problems in continuum dynamics is seriously limited by the computation rates attainable on computers with serial architecture. Parallel processing machines can achieve much higher rates. However, applying additional processors to a calculation is only part of the solution. This research was undertaken to develop parallel algorithms for explicit and implicit, Lagrangian and Eulerian finite difference schemes for computational continuum dynamics in one spatial dimension. First, the explicit conservation equations in the Lagrangian reference frame were readily reformulated for concurrent processing. Second, an implicit solution was derived for these equations. This is important because it yields unconditional stability. The parallelism is achieved bia a block implicit numerical scheme. Third, a rezoning algorithm was employed with each Lagrangian integration stem to transform the mesh back to the Eulerian reference frame. The algorithmic development path lead to a parallelization of the processing in blocks of the finite difference zones. At each step of this research project, the derived numerical methods provided effective algorithms for exploiting the architectural advantages of the HEP H1000 (Heterogeneous Element Processor) computer. The computational timing data shows significant speed-up with the number of processes. Author (GRA)

N86-15001# Illinois Univ., Urbana. Center for Supercomputing Research and Development.
DESIGN, EVALUATION AND USE OF HIGH PERFORMANCE COMPUTER SYSTEMS Final Report, 1 Jan. 1981 - 31 Dec. 1984
D. J. Kuck Jun. 1985 9 p
(Contract DE-AC02-81ER-10822)
(DE85-016729; DOE/ER-10822/4) Avail: NTIS HC A02/MF A01

Our work on this DOE contract led us from the position in 1981 of being active in research on a number of supercomputing issues to the position in late 1984 of being ready to commence the Cedar system development. We have pursued architecture, software, and algorithm issues in the past to the point where we are currently building a high-performance prototype Cedar system. Based on our prior research and outside consulting activities, we are now in a position to buy Cedar clusters of 8 high-performance processors. This allows us to build control and switching hardware to integrate the clusters into a high-performance multiprocessor. Our prior software work allows us now to develop compiler and operating system software with a great deal of confidence, and our parallel algorithm work has prepared us to undertake a number of complete applications for the Cedar system. We believe that this contract has been very instrumental in leading us to be able to make decisions that will substantially reduce the risk in building the Cedar system on schedule, and will enhance the performance of the resulting hardware and software. DOE

N86-15002# Los Alamos National Lab., N. Mex.
LINKED STATE MACHINES: MODELS. VOLUME 1
H. K. Knudsen Apr. 1985 20 p refs
(Contract W-7405-eng-36)
(DE85-017945; LA-10400-MS-Vol-1) Avail: NTIS HC A02/MF A01

The linked state machine (LSM) consists of a collection of elementary state machines (ESMs) that are linked together by signals that are derived from the states of the ESMs. LSMS are defined, and then shown to correspond to a special class of marked Petri nets. Linked state machines can be used to model the finite state, nondeterministic, and possibly concurrent processes that arise in the study of communications protocols, digital hardware, and computer programs. The models developed here form a foundation for the analysis and design of LSMs. Further properties of LSMs, and procedures for their analysis and design, are presented in the companion volumes of this report. DOE

N86-15003# Oak Ridge National Lab., Tenn.
NAVY AIRCRAFT SUPPORT DATA SYSTEMS STUDY: ECAMS/NALCOMIS INTEGRATION FEASIBILITY AND PROCEDURE
K. R. Carr Aug. 1985 78 p
(Contract DE-AC05-84OR-21400)
(DE85-016977; ORNL/TM-9656) Avail: NTIS HC A05/MF A01

A study was done to identify and evaluate options for providing major improvements, extensions, and integration of essential automatic data processing equipment. This work is part of a long-term (several years duration) project in which Oak Ridge National Laboratory (ORNL) is establishing a center of excellence in support of the Department of the Navy in the Shipboard Nontactical Automated Data Processing Program. The program involves Honewell DPS-6 minicomputers, Digital Equipment Corporation PDP-11 minicomputers, Zenith personal computers,

and magnetic tape recorders for surface processing of in-flight recorded data. The central issue addressed in this report is hardware and software options for interfacing the tape readers to the Honeywell equipment. Three leading candidate methods for providing the required interface were identified and analyzed. Variations of one method were also analyzed. A system-by-system comparison of the options is given in seven key areas: data transfer speed, data transmission distance capabilities, adaptability for processing classified data, flexibility and/or expandability, space required, logistics, and cost. DOE

N86-15004# Centre Technique des Industries Mecaniques, Senlis (France).
CENTRALIZED ENERGY ACCOUNTING SYSTEMS Final Report [SYSTEME DE COMPTABILISATION CENTRALISEE DE L'ENERGIE]
C. Drussant and J. C. Lecoufle Dec. 1984 76 p refs In FRENCH
(CETIM-102-100) Avail: NTIS HC A05/MF A01

Available energy accounting systems for private enterprises in France are surveyed. A table comparing 27 commercially available microprocessor centralized systems is presented. The addresses of the manufacturers are included. Author (ESA)

N86-15005# National Aerospace Lab., Amsterdam (Netherlands). Informatics Div.
SIMULATION USED FOR STEPWISE REALIZATION OF A COMPUTER AND TERMINAL NETWORK
J. T. vandenHoven and W. H. deVries 22 Mar. 1984 14 p refs In DUTCH; ENGLISH summary Presented at Ned. Genootschap voor Informatica, Stichting Informatie en Onderzoek in Ned., Amsterdam, 16-17 Apr. 1984
(NLR-MP-84026-U; B8566270) Avail: NTIS HC A02/MF A01

Simulation was used to predict the variation of response times with the number of users at different parameter institutions, in case of realization and extension of a computer network. A software package describing the behavior of computers and computer networks, based on discrete event simulation is presented. Verification of the model shows that solutions can be modelled and calculated in a simple way if realization is done in sufficiently small steps. Author (ESA)

N86-14452# Joint Publications Research Service, Arlington, Va.
SOVIET COOPERATION IN COMPUTER NETWORKS TELEDATA PROCESSING
Geza Odor *In its* East Europe Report: Science and Technology (JPRS-ESA-85-032) 28 Oct. 1985 p 77-78 Transl. into ENGLISH from Muszaki Elet (Budapest), 17 Aug. 1985 p 3 (For primary document see N86-14450 05-31)
Avail: NTIS HC A05/MF A01

N86-14456# Joint Publications Research Service, Arlington, Va.
FRG RESEARCH NETWORK TO INCREASE ACCESS TO COMPUTERS
Uli Deker *In its* West Europe Report: Science and Technology (JPRS-WST-85-026) 4 Sep. 1985 p 40-48 Transl. into ENGLISH from Bild der Wissenschaft (Stuttgart), Apr. 1985 p 76-94 (For primary document see N86-14454 05-31)
Avail: NTIS HC A04/MF A01

N86-15173*# Mitre Corp., Houston, Tex.
COMPUTER SYSTEMS MEASURES
F. T. Crucian *In* NASA. Johnson (Lyndon B.) Space Center R and D Productivity: New Challenges for the US Space Program 1985 p 177-191 (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 09B

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support.*

N86-15006 Ohio State Univ., Columbus.
CONTROL OF CONSTRAINED MOTION IN NATURAL AND ROBOTIC SYSTEMS Ph.D. Thesis
Chaiyong Wongchaisuwat 1985 120 p
Avail: Univ. Microfilms Order No. DA8519045

The analysis and control of constrained motion are considered. The analysis of a three-link planar arm coming into contact with and moving along a surface as a robot system, and a planar knee joint model involving the relative motion of the contacting surface between the tibia and the femur as a natural system are presented. Feasible control strategies are proposed to stabilize the motion, maintain specified kinematic constraint and provide for both the state and the force of constraint to follow desirable specified trajectory. A control strategy with two componetns of feedforward inverse dynamics and nonlinear gain state feedback for the three-link planar arm is proposed. This study demonstrates the concept of relegated control where different control functions are relegated to different sets of actuators. The issue of relegated control is formalized and applied to a three-link robot. Digital computer simulations demonstrate that this control approach provides better performance in maintaining the constraints and force trajectories. Dissert. Abstr.

N86-15007# Illinois Univ., Urbana.
[BIBLIOGRAPHY OF PUBLICATIONS ISSUED BY THE UNIVERSITY OF ILLINOIS] Final Report
D. L. Waltz 11 Jul. 1985 8 p
(Contract N00014-76-C-0612)
(AD-A158901) Avail: NTIS HC A02/MF A01 CSCL 05/10

Thirteen abstracts of papers published in journals, books, and conference proceedings are presented. These papers are mainly centered on artificial intelligence, natural language research, and parallel parsing. E.R.

N86-15008# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
RECOGNITION AND LOCALIZATION OF OVERLAPPING PARTS FROM SPARSE DATA
W. E. L. Grimson and T. Lozano-Perez Jun. 1985 43 p
(Contracts N00014-80-C-0505; N00014-82-K-0334)
(AD-A158394; AI-M-841) Avail: NTIS HC A03/MF A01 CSCL 12/1

In order to interact intelligently with its environment, a robot must know what objects are where; that is, it must be able to identify and locate objects in its workspace. In this paper, we treat these two tasks under the title of the recognition problem. We will stress localization over identification since in most industrial robotics tasks the identity of the objects is known. This paper discusses how sparse local measurements of positions and surface normals may be used to identify and locate overlapping objects. The objects are modeled as polyhedra (or polygons) having up to six degrees of positional freedom relative to the sensors. The approach operates by examining all hypotheses about pairings between sensed data and object surfaces and efficiently discarding inconsistent ones by using local constraints on: distances between faces, angles between face normals, and angles (relative to the surface normals) of vectors between sensed points. The method described here is an extension of a method for recognition and localization of non-overlapping parts previously described. GRA

N86-15009# Connecticut Univ., Storrs.
STOCHASTIC ADAPTIVE CONTROL AND ESTIMATION ENHANCEMENT Final Report, Feb. 1980 - Apr. 1984
Y. Bar-Shalom 19 Mar. 1985 72 p
(Grant AF-AFOSR-0098-80)
(AD-A159053; AFOSR-85-0688TR) Avail: NTIS HC A04/MF A01 CSCL 12/1

This report presents the results of the investigations conducted over a period of four years on control algorithms designed for stochastic systems. The main feature of these algorithms is that these account for: (1) the current uncertainty in the system; and (2) the anticipated future uncertainty in the system, which is in general control-dependent. The first feature leads to the control

to have the cautious property in order to minimize the effect of the current uncertainties of the system's performance. The second feature allows the control to affect in addition to the system's state also the system's uncertainty. Such a controller is called dual controller because, by taking advantage of its dual effect has the capability of reducing the future uncertainties. These uncertainties can pertain to the system's state or its unknown parameters. Both continuous-valued and discrete-valued uncertainties have been considered. GRA

N86-15010# Argonne National Lab., Ill.
TUTORIAL ON THE WARREN ABSTRACT MACHINE FOR COMPUTATIONAL LOGIC
J. Gabriel, T. Lindholm, E. L. Lusk, and R. A. Overbeek Jun. 1985 56 p
(Contract W-31-109-eng-38)
(DE85-016925; ANL-84-84) Avail: NTIS HC A04/MF A01

Computational logic can roughly be defined as that branch of artifical intelligence that is based on logic. It includes logic programming, theorem-proving, rewrite-rule systems, and production-rule systems. Such fields are going through a truly interesting transition. It now is becoming apparent that performance improvements for computational logic systems could be as high as 3 to 5 orders or magnitude during the next 5 to 7 years. These improvements will come from three distinct sources: (1) The processors used in the commonly available computing systems will improve by a factor of 5 to 10. That is, commonly available, cheap processors will increase substantially in speed. (2) Multiprocessors featuring up to 1024 nodes will become widely available. Each node may contain 4 to 16 tightly coupled processors (on a shared memory). (3) Substantial speedups will occur due to improvements in the implementation of the basic algorithms. The last point is the focus of this document. DOE

N86-15011# Technische Hogeschool, Delft (Netherlands). Lab. voor Elektronische Instrumentatie.
HIERARCHIC STRUCTURED SIGNAL PROCESSING FOR ROBOTS [HIERARCHISCH GESTRUCTUREERDE SIGNAALVERWERKING BIJ ROBOTS]
J. T. vanDop Jun. 1984 49 p refs In DUTCH; ENGLISH summary
(Rept-051547-A.84-01) Avail: NTIS HC A03/MF A01

A hierarchic structured signal processing system for a C-S 111 Sciento robot arm is described. Sensor information is used to lead the arm to the exact location of an object. To give the robot complicated instructions in an abstract way, instructions are broken down into less complicated steps, in a hierarchical control system, until at the bottom of the hierarchy directly performable instructions occur. An interpreter for a robot language to implement this hierarchical system was developed. Author (ESA)

N86-15012# Technische Hogeschool, Delft (Netherlands). Lab. voor Elektronische Instrumentatie.
A ROBOT CONTROLLER BASED ON MULTIPROCESSING [EEN ROBOT CONTROLLER GEBASEERD OP MULTIPROCESSING]
W. A. Koelman Jun. 1984 115 p refs In DUTCH; ENGLISH summary
(Rept-051.547.A.84-02) Avail: NTIS HC A06/MF A01

A multiprocessor using microprocessors as the parallel processing elements for robots was built. An interpreter, a proces for motor control, a system monitor, and a coordinate transformer are incorporated. Author (ESA)

N86-15013# Technische Hogeschool, Delft (Netherlands). Lab. voor Elektronische Instrumentatie.
THE MICROPROCESSOR CONTROLLED STEPPING MOTOR AS ROBOT ACTUATOR [DE MICROPROCESSOR GESTUURDE STAPPENMOTOR ALS ROBOT ACTUATOR]
R. Moerman Jun. 1984 102 p refs In DUTCH; ENGLISH summary
(Rept-051.547.A.84-04) Avail: NTIS HC A06/MF A01

The design and implementation of a microprocessor based control system in a miniature robot are described. The robot is driven by stepping motors and is equipped with sensors for primary functions. The robot can be controlled with a pendant or with a high level command language as part of a parallel processing system. Author (ESA)

N86-14950# Cornell Univ., Ithaca, N.Y. Dept. of Computer Science.
MATHEMATICAL FOUNDATIONS FOR ROBOTICS
J. E. Hopcroft *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 835-837 (For primary document see N86-14902 05-59)
(AD-P004951) Avail: NTIS HC A99/MF E03 CSCL 12/1

N86-15190*# National Aeronautics and Space Administration. Johnson (Lyndon B.) Space Center,
THE ROLE OF ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS IN INCREASING STS OPERATIONS PRODUCTIVITY
Chris Culbert *In its* R and D Productivity: New Challenges for the US Space Program 1985 p 378-382 (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 09B

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N86-15014*# Old Dominion Univ., Norfolk, Va. Dept. of Mechanical Engineering and Mechanics.
FORMULATION AND APPLICATION OF RUSSELL'S METHOD Final Report, period ending 31 Mar. 1985
Jean Win Hou Oct. 1985 79 p refs
(Grant NAG1-501)
(NASA-CR-176423; NAS 1.26:176423) Avail: NTIS HC A05/MF A01 CSCL 12A

It is shown that the numerical technique of Russell's momentum approach can be derived by using Hamilton's principle and Vance's numerical scheme. It results in a set of first order differnce equations for solving the angular velocities. The numerical examples show that the method is reliable. The algorithm is modified next to perform the analysis of N-body systems with closed loop topology. To increase the formulation flexibility, the equations of motion are represented by using Cartesian coordinates and Lagrange multipliers. The algorithm consists of two parts, Vance's scheme and an unconstrained minimization. The Vance's scheme is used to find the angular velocities, and the unconstrained minimization is applied to provide the correct angular displacements. The proposed scheme is further extended to find the design sensitivity of an N-body system with closed loop configuration, and to carry out the design optimization as well. The numerical example of a small-scaled mechanical system is presented to verify the proposed formulation. Author

N86-15015# Stanford Univ., Calif. Systems Optimization Lab.
PROPERTIES OF A REPRESENTATION OF A BASIS FOR THE NULL SPACE
P. E. Gill, W. Murray, M. A. Saunders, G. W. Stewart, and M. H. Wright Feb. 1985 19 p Prepared in cooperation with Maryland Univ., College Park
(Contracts N00014-75-C-0267; DAAG29-84-K-0156; DE-AM03-76FO-0326; DE-AT03-76ER-72018; Grants AF-AFOSR-0078-82; NSF MCS-79-26009; NSF ECS-83-12142)
(AD-A157681; SU-SOL-85-1) Avail: NTIS HC A02/MF A01 CSCL 12/1

Given a rectangular matrix A(x) that depends on the independent variables x, many constrained optimization methods involve computations with Z(x), a matrix whose columns for a basis for the null space of A sub T(x). When A lis evaluated at a given point, it is well known that a suitable Z (satisfying A sub TZ = 0) can be obtained form standard matrix factorizations. However, Coleman and Sorensen have recently shown that standard orthogonal factorization methods may produce orthogonal bases

that do not vary continuously with x; they also suggest several techniques for adapting these schemes so as to ensure continuity of Z in the neighborhood of a given point. This paper is an extension of an earlier note that defines the procedure for computing Z. Here, the authors first describe how Z can be obtained by updating and explicit QR factorization with Householder transformations. The properties of this representation of Z with respect to perturbations in A are discussed, including explicit bounds on the change in Z. They then introduce regularized Householder transformations, and show that their use implies continuity of the full matrix Q. The convergence of Z and Q under appropriate assumptions is then proved. Finally, it is indicated why the chosen form of Z is convenient in certain methods for nonlinearly constrained optimization. Author (GRA)

N86-15016# Brown Univ., Providence, R. I. Center for Dynamical Systems.
IDENTIFIABILITY UNDER APPROXIMATION FOR AN ELLIPTIC BOUNDARY VALUE PROBLEM Interim Report
K. Kunisch and L. W. White Apr. 1985 41 p
(Grant AF-AFOSR-0398-84)
(AD-A158542; LCDS-85-13; AFOSR-85-0554TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

Necessary and sufficient conditions for identifiability of the diffusion coefficient in Galerkin approximations to a two point boundary value problem are derived for various choices of Galerkin subspaces. The results are further used to investigate output least squares identifiability and output least squares stability of the diffusion coefficient. Author (GRA)

N86-15017# Brown Univ., Providence, R. I. Center for Dynamical Systems.
VARYING BOUNDARY CONDITIONS WITH LARGE DIFFUSIVITY
J. K. Hale and C. Rocha Mar. 1985 42 p
(Contract DAAG29-83-K-0029; Grants AF-AFOSR-0376-84; NSF DMS-82-05355)
(AD-A158643; LCDS-85-5; AFOSR-85-0527TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

For systems of semilinear parabolic partial differential equations on bounded domains with large diffusivity and homogeneous boundary conditions close to the Newmann conditions, the authors associate a system of ordinary differential equations (ode's) from which the dynamics of the original system can be inferred. Small perturbations of the Newmann case produce large perturbations in the ode's with corresponding effects on the dynamics of the system. The same theory is valid for functional differential equations. Applications are considered in models for control by genetic repression of biological material in cells. Author (GRA)

N86-15018# California Univ., Berkeley. Operations Research Center.
COMPUTATIONAL COMPLEXITY OF COHERENT SYSTEMS AND THE RELIABILITY POLYNOMIAL
R. E. Barlow and S. Iyer Jul. 1985 17 p
(Contract N00014-85-K-0384; AF Proj. 2304)
(AD-A158689; ORC-85-6) Avail: NTIS HC A02/MF A01 CSCL 12/1

There are three general methods for system reliability evaluation, namely: (1) inclusion-exclusion, (2) sum of disjoint products, and (3) pivoting. Of these, only pivoting can be applied directly to a logic tree or network graph representation without first finding minimal path (or cut) sets. Domination theory provides the basis for selecting optimal pivoting strategies. Simple proofs of domination theory results for coherent systems are given, based on the reliability polynomial. These results are related to the problem of finding efficient strategies for computing coherent system reliability. The original results for undirected networks are due to Satyanarayana and Chang (1983). Many of the original set theoretic results are due to Huseby (1984). However, he does not use the reliability polynomial to prove his results. Author (GRA)

N86-15019# North Carolina Univ., Chapel Hill. Center for Stochastic Processes.
HITTING A BOUNDARY POINT BY DIFFUSIONS IN THE CLOSED HALF SPACE Technical Report, 1 Sep. 1984 - 31 Aug. 1985
S. Ramasubramanian Jun. 1985 17 p
(Contract F49620-82-C-0009)
(AD-A159180; TR-108; AFOSR-85-0703TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

It is known that a Brownian motion in the unit sphere, with normal reflection at the boundary, does not hit a specified point on the boundary. The aim of this article is to prove that a non-degenerate diffusion in the closed half space, with certain Wentzell-type boundary conditions, does not hit a point on the boundary specified in advanced. We also give an application to a boundary value problem. GRA

N86-15020# North Carolina Univ., Chapel Hill. Center for Stochastic Processes.
PRODUCT STOCHASTIC MEASURES, MULTIPLE STOCHASTIC INTEGRALS AND THEIR EXTENSIONS TO NUCLEAR SPACE VALUED PROCESSES Technical Report, 1 Sep. 1984 - 31 Aug. 1985 Ph.D. Thesis
V. M. Perez-Abreu C. Jun. 1985 195 p
(Contract F49620-82-C-0009)
(AD-A159181; TR-107; AFOSR-85-0704TR) Avail: NTIS HC A09/MF A01 CSCL 12/1

A theory of L sub 2 valued product stochastic measures of non-identically distributed L sub 2 - independently scattered measures is developed using concepts of symmetric tensor product Hilber spaces. Applying the theory of vector valued measures we construct multiple stochastic integrals with respect to the product stochastic measures. A clear relationship between the theories of vector valued measures and multiple stochastic integrals is established. This work is related to the work by D.D. Engel (1982) who gives a different approach to the construction of product stochastic measures. The two approaches are compared. The second part of the work deals with multiple Wiener integrals and nonlinear functionals of a phi - valued Wiener process W sub t where phi is the dual of a Countably Hilbert Nuclear Space. We obtain the Wiener decomposition of the space of phi-valued nonlinear functionals as an inductive limit of appropriate Hilbert spaces. It is shown that every phi - valued nonlinear functional admits an expansion in terms of multiple Wiener integrals in one of these Hilbert spaces and can be represented as an operator valued stochastic integral of the Ito type. Author (GRA)

N86-15021# North Carolina Univ., Chapel Hill. Center for Stochastic Processes.
LINEAR STOCHASTIC DIFFERENTIAL EQUATIONS ON THE DUAL OF A COUNTABLY HILBERT NUCLEAR SPACE WITH APPLICATIONS TO NEUROPHYSIOLOGY Technical Report, Sep. 1984 - Aug. 1985
S. K. Christensen Jun. 1985 218 p
(Contract F49620-82-C-0009)
(AD-A159198; TR-104; AFOSR-85-0705TR) Avail: NTIS HC A10/MF A01 CSCL 12/1

Properties of the Ornstein-Uhlenbeck on the dual of a nuclear space are derived; stationarity and existence of unique invariant measure is proved, Radon-Nikodym derivative exhibited and the OU process is investigated for flicker noise. Existence and uniqueness of solutions to linear stochastic differential equations on the dual of a nuclear space established, and general conditions for the weak convergence on Skorohod space of solutions are given. Moreover, solutions are shown to be CADLAG semimartingales (for appropriate initial conditions). The results are applicable to solving stochastic partial differential equations. Finally, the results are applied to giving a rigorous representation and solutions of models in neurophysiology as well as to deriving explicit results for the weak convergence of these solutions. Author (GRA)

N86-15022# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
LOCAL ROTATIONAL SYMMETRIES M. S. Thesis

M. M. Fleck Aug. 1985 157 p
(Contracts N00014-80-C-0505; N00014-77-C-0389)
(AD-A159522; AI-TR-852) Avail: NTIS HC A08/MF A01 CSCL 12/1

This thesis describes a new representation for two-dimensional round regions called Local Rotational Symmetries. Local Rotational Symmetries are intended as a companion to Brady's Smoothed Local Symmetry Representation for elongated shapes. An algorithm for computing Local Rotational Symmetry representations at multiple scales of resolution has been implemented and results of this implementationnare presented. These results suggest that Local Rotational Symmetries provide a more robustly computable and perceptually accurate description of round regions than previous proposed representations. In the course of developing this representation, it has been necessary to modify the way both Smoothed Local Symmetries and Local Rotational Symmetries are computed. First, grey-scale image smoothing proves to be better than boundary smoothing for creating representations at multiple scales of resolution, because it is more robust and it allows qualitative changes in representations between scales. Secondly, it is proposed that shape representations at different scales of resolution be explicitly related, so that information can be passed between scales and computation at each scale can be kept local. Such a model for multi-scale computation is desirable both to allow efficient computation and to accurately model human perceptions. GRA

N86-15023# Carnegie-Mellon Univ., Pittsburgh, Pa. Robotics Inst.
OPTIMAL ALGORITHMS FOR FINDING THE SYMMETRIES OF A PLANAR POINT SET Interim Report
P. T. Highnam Aug. 1985 11 p
(Contract F33615-83-C-1023; ARPA Order 3597)
(AD-A159625; CMU-RI-TR-85-13) Avail: NTIS HC A02/MF A01 CSCL 12/1

This document presents an asymptotically optimal algorithm to locate all the axes of mirror symmetry of a planar point set. The algorithm was derived by reducing the 2-D symmetry problem to linear pattern-matching. Optimal algorithms for finding rotational symmetries and deciding whether a point symmetry exists are also presented. Section 2 of this report contains the algorithm, and section 3 contains proof of why the algorithm works. Section 4 demonstrates that it is impossible to improve the asymptotic time bound. Section 5 presents a variant of the basic algorithm which detects the rotational symmetries and point symmetry, and a proof that these are also optimal. GRA

N86-15024# Los Alamos National Lab., N. Mex.
THREE-DIMENSIONAL FREE LAGRANGIAN HYDRODYNAMICS
H. E. Trease 1985 14 p refs Presented at the International Conference on Fluid Dynamics, Reading, England, 1 Apr. 1985
(Contract W-7405-eng-36)
(DE85-015707; LA-UR-85-2479; CONF-8504150-2) Avail: NTIS HC A02/MF A01

The purpose of the discussion is to describe the development of a 3-D free Lagrangian hydrodynamics algorithm. The 3-D algorithm is an outgrowth of an earlier 2-D free Lagrange model. Only the more pertinent issues of the free Lagrange algorithm are presented. A complete production code is being developed to support the free Lagrange algorithm described. DOE

N86-15025# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Applied Mathematics.
STRUCTURED POPULATIONS, LINEAR SEMIGROUPS AND POSITIVITY
H. J. A. M. Heijmans Dec. 1984 20 p refs Submitted for publication
(CWI-AM-R8417; B8565124) Avail: NTIS HC A02/MF A01

A general model represented by a first-order partial differential equation with boundary and initial conditions, describing the growth of a biological population is formulated and it is indicated how several physiological structures fit into this model. It is shown that the semigroup associated with the problem is positive and irreducible. Therefore the Perron-Frobenius theory of positive semigroups can be applied in order to obtain relevant information on the spectrum of the semigroup, and this can be used to characterize the large time behavior of solutions. Author (ESA)

N86-15026# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Applied Mathematics.
HOLLING'S HUNGRY MANTID MODEL FOR THE INVERTEBRATE FUNCTIONAL RESPONSE CONSIDERED AS A MARKOV PROCESS. PART 1: THE FULL MODEL AND SOME OF ITS LIMITS
J. A. J. Metz (Leiden Univ.) and F. H. D. vanBatenburg (Leiden Univ.) Dec. 1984 50 p refs Submitted for publication 2 Vol.
(CWI-AM-R8419; B8565127) Avail: NTIS HC A03/MF A01

An analytical reformulation of Holling's (1966) simulation model for invertebrate predatory behavior is presented. A predator population is represented as a frequency distribution over a space of (physiological) states. The functional response of a predator is calculated from the (stable) equilibrium distribution of its state as a function of prey density. Starting from the general model, other models are obtained as limit processes.
Author (ESA)

N86-15027# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Applied Mathematics.
HOLLING'S HUNGRY MANTID MODEL FOR THE INVERTEBRATE FUNCTIONAL RESPONSE CONSIDERED AS A MARKOV PROCESS. PART 2: NEGLIGIBLE HANDLING TIME
J. A. J. Metz (Leiden Univ.) and F. H. D. vanBatenburg (Leiden Univ.) Dec. 1984 36 p refs Submitted for publication 2 Vol.
(CWI-AM-R8420; B8565126) Avail: NTIS HC A03/MF A01

A stochastic model for invertebrate predation taking account of the predator's satiation is analyzed. This model approximates Holling's (1966) hungry mantid model when handling time is negligable. For this model equations to calculate the functional response and the variance of the total catch are derived. Approximations which can be used to calculate these quantities in practical cases in a relatively simple manner are studied.
Author (ESA)

N86-15028# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Applied Mathematics.
THE PYTHAGORAS TREE AS A JULIA SET
H. A. Lauwerier Jan. 1985 16 p refs Submitted for publication
(CWI-AM-R8503; B8565130) Avail: NTIS HC A02/MF A01

Properties of the so-called Pythagoras tree are considered, especially with respect to iterated mappings, self-similarity and Julia sets. The approach is based on binary representations of real numbers and on the use of complex variables. Author (ESA)

N86-15029# Center for Mathematics and Computer Science, Amsterdam (Netherlands).
ON THE STABILITY OF THE CELL SIZE DISTRIBUTION 2: TIME-PERIODIC DEVELOPMENTAL RATES
O. Diekmann, H. J. A. M. Heijmans, and H. R. Thieme (Heidelberg Univ.) Jan. 1985 26 p refs Sponsored by Deutsche Forschungsgemeinschaft and Netherlands Organization for Advanced Research
(CWI-AM-R8504; B8565131) Avail: NTIS HC A03/MF A01

A deterministic model for the growth of a size-structured proliferating cell population is analyzed. The developmental rates are allowed to vary with time. For periodically varying rates stability of the cell size distribution is shown under similar conditions for the growth rate of individual cells as found in the time-homogeneous case. Strongly positive quasicompact linear operators on Banach lattices are used. The autonomous case is reconsidered and the conditions for stability are relaxed. Author (ESA)

N86-15030# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Applied Mathematics.
SIMPLE MATHEMATICAL MODELS FOR CANNIBALISM: A CRITIQUE AND A NEW APPROACH

O. Diekmann, R. M. Nisbet (Strathcylde Univ., Scotland), W. S. C. Gurney (Strathcylde Univ., Scotland), and F. vandenBosch Jan. 1985 20 p refs
(CWI-AM-R8505; B8565132) Avail: NTIS HC A02/MF A01

A method to incorporate a functional response in the Gurtin and Levine (1979, 1982) models of egg cannibalism is outlined. Starting from a relatively complicated model with vulnerability spread over an age interval of finite duration (epsilon) a much simpler model is reached by passing to the limit epsilon descends to zero. It turns out that survivorship through the vulnerable stage is implicity determined by the solution of a scalar equation. Analysis of the existence and stability of steady states produces (analytically in a simple case, numerically in more general situations) curves in a two-dimensional parameter space where a nontrivial steady state losses its stability and a periodic solution arises through a Hopf bifurcation. Author (ESA)

N86-15031# Fondazione Ugo Bordoni, Rome (Italy).
EIGENVALUE REPRESENTATION IN DISTANCE MATRICES [RAPPRESENTAZIONE AGLI AUTOVALORI DI MATRICI DI DISTANZE]
Antonio Federico Dec. 1984 41 p refs In ITALIAN
(FUB-18-1984) Avail: NTIS HC A03/MF A01

A linear method to represent a distance matrix with n points in a p dimensional space is described. The identification of p and the functions that define the representation error are obtained. The method is particularly adapted to array processing. The results can be taken as initial state to seek the minimum with nonlinear optimization methods. The main applications are the recognition of isolated words in speech, the analysis of subjective relational data, and the reduction of dimensions for better understanding the structure of multivariate data. Author (ESA)

N86-15032# Fondazione Ugo Bordoni, Rome (Italy).
SOME STATISTICAL PROPERTIES OF BLOCK CODED BINARY SIGNALS WITH POLARITY DIGIT [ALCUNE PROPRIETA STATISTICHE DEI CODICI BINARI A BLOCCHI CON CIFRA DI POLARITA]
Odoardo Brugia, Adina Diporto, Piero Filipponi, and Salvatore Improta (FATME SpA) Dec. 1984 31 p refs In ITALIAN
(FUB-22-1984) Avail: NTIS HC A03/MF A01

Determination as a function of the block length of the probability of the admisable values of the terminal sum and the running digital sum is outlined. The method is based on the enumeration of the possible paths in oriented networks. These oriented graphs are the representation of all possible sequences of the running digital sum values. The results are useful to determine the efficiency of the estimation of the error rate by sum overflow methods.
Author (ESA)

N86-14913# Maryland Univ. Baltimore County, Catonsville.
NON-PERIODIC CONDITIONS FOR CHAOS AND SNAP-BACK REPELLERS
N. P. Bhatia and W. O. Egerland *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 159-164 (For primary document see N86-14902 05-59)
(AD-P004912) Avail: NTIS HC A99/MF E03 CSCL 12/1

N86-14914# Indiana Univ.-Purdue Univ., Indianapolis.
ON THE NUMERICAL SOLUTION OF SINGULARLY PERTURBED LINEAR TWO-POINT BOUNDARY-VALUE PROBLEMS
B. S. Nq and W. H. Reid *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 165-175 (For primary document see N86-14902 05-59)
(Grants NSF MCS-81-01932; NSF MCS-83-01125)
(AD-P004913) Avail: NTIS HC A99/MF E03 CSCL 12/1

N86-14915# Wisconsin Univ., Madison. Mathematics Research Center.
SELF SIMILAR SOLUTIONS FOR A DEGENERATE CAUCHY PROBLEM
K. Hoellig and J. A. Nohel *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 177-183 (For primary document see N86-14902 05-59)
(Contract DAAG29-80-C-0041)
(AD-P004914) Avail: NTIS HC A199/MF E03 CSCL 12/1

N86-14916# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.
VARIATIONAL PRINCIPLE FOR PENETRATOR DYNAMICS USING BILINEAR FUNCTIONAL AND ADJOINT FORMULATION
C. N. Shen *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 185-197 (For primary document see N86-14902 05-59)
(AD-P004915) Avail: NTIS HC A99/MF E03 CSCL 12/1

N86-14928# Army Materials and Mechanics Research Center, Watertown, Mass.
ANISOPARAMETRIC FINITE ELEMENT METHODOLOGY FOR PENALTY CONSTRAINS FORMULATIONS IN SOLID MECHANICS
A. Tessler *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 343-358 (For primary document see N86-14902 05-59)
(AD-P004927) Avail: NTIS HC A99/MF E03 CSCL 12/1

N86-14931# National Bureau of Standards, Gaithersburg, Md.
THE INVERSE GAUSSIAN PULSE IN THE EXPERIMENTAL DETERMINATION OF LINEAR SYSTEM GREEN'S FUNCTIONS
A. S. Carasso and N. N. Hsu *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 389-404 (For primary document see N86-14902 05-59)
(Contract MIPR-ARO-63-82)
(AD-P004930) Avail: NTIS HC A99/MF E03 CSCL 12/1

N86-14933# Pennsylvania State Univ., University Park. Wave Propagation Lab.
ON AN IMPROVED T-MATRIX APPROACH TO STUDY THE SCALAR SCATTERING RESPONSE OF DOUBLY PERIODIC SURFACES
A. Lakhtakia, V. K. Varadan, and V. V. Varadan *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 471-481 (For primary document see N86-14902 05-59)
(AD-P004933) Avail: NTIS HC A99/MF E03 CSCL 12/1

N86-14935# Illinois Univ., Chicago. Dept. of Civil Engineering Mechanics and Metallurgy.
DISCONTINUOUS DEPENDENCE OF SOLUTION ON BOUNDARY CONDITIONS FOR LARGE AMPLITUDE SHOCK WAVES
T. C. T. Ting *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 501-511 (For primary document see N86-14902 05-59)
(AD-P004935) Avail: NTIS HC A99/MF E03 CSCL 12/1

N86-14936# Coulter Electronics Co., Chicago, Ill.
FRONT TRACKING AND TWO DIMENSIONAL RIEMANN PROBLEMS: A CONFERENCE REPORT
J. Glimm, C. Klingenberg, O. McBryan, B. Plohr, and D. Sharp *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Comuting Feb. 1985 p 513-533 Previously announced as N85-21589 (For primary document see N86-14902 05-59)
(Contract DE-A02-76ER-03077)
(AD-P004936) Avail: NTIS HC A99/MF E03 CSCL 20/4

N86-14938# Rensselaer Polytechnic Inst., Troy, N.Y.
A LOCAL REFINEMENT FINITE ELEMENT METHOD FOR TIME DEPENDENT PARTIAL DIFFERENTIAL EQUATIONS
J. E. Flaherty and P. K. Moore *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 03664 Previously announced as N85-17620 (For primary document see N86-14902 05-59)

(Contract DAAG29-82-K-0197; Grant AF-AFOSR-0192-80)
(AD-P004938) Avail: NTIS HC A99/MF E03 CSCL 12/1

N86-14940# Rensselaer Polytechnic Inst., Troy, N.Y.
A MESH MOVING TECHNIQUE FOR TIME DEPENDENT PARTIAL DIFFERENTIAL EQUATIONS IN TWO SPACE DIMENSIONS
D. C. Arney and J. E. Flaherty *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 611-633 (For primary document see N86-14902 05-59)
(Contract DAAG29-82-K-0197; Grant AF-AFOSR-0192-80)
(AD-P004940) Avail: NTIS HC A99/MF E03 CSCL 12/1

N86-14944# Ballistic Research Labs., Aberdeen Proving Ground, Md.
A METHODOLOGY FOR THE DEVELOPMENT OF FIRE CONTROL EQUATIONS FOR GUNS AND ROCKETS FIRED FROM AIRCRAFT
H. J. Breaux *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 729-735 (For primary document see N86-14902 05-59)
(AD-P004945) Avail: NTIS HC A99/MF E03 CSCL 12/1

N86-14945# Iowa Univ., Iowa City. Coll. of Engineering.
SINGULAR VALUE DECOMPOSITION FOR SOLUTION OF DIFFERENTIAL-ALGEBRAIC EQUATIONS OF MECHANICAL SYSTEM DYNAMICS
N. K. Mani and E. J. Haug *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 737-763 (For primary document see N86-14902 05-59)
(Grant DAAE07-82-G-4004)
(AD-P004946) Avail: NTIS HC A99/MF E03 CSCL 12/1

N86-14947# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.
RECURSIVE GRADIENT ESTIMATION USING SPLINES FOR NAVIGATION OF AUTONOMOUS VEHICLES
C. N. Shen *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 787-808 (For primary document see N86-14902 05-59)
(AD-P004948) Avail: NTIS HC A99/MF E03 CSCL 12/1

N86-14949# Army Natick Research and Development Command, Mass.
A COMPUTATIONAL METHOD FOR FIELD DETECTION OF UNKNOWN SUBSTANCES
E. W. Ross *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 815-833 (For primary document see N86-14902 05-59)
(AD-P004950) Avail: NTIS HC A99/MF E03 CSCL 12/1

N86-14957# Texas A&M Univ., College Station. Dept. of Mathematics.
B-SPLINES ON NONUNIFORM TRIANGULATIONS
C. K. Chui *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 939-942 (For primary document see N86-14902 05-59)
(AD-P004958) Avail: NTIS HC A99/MF E03 CSCL 12/1

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N86-15033# Stanford Univ., Calif. Dept. of Operations Research.
SYMMETRIC STOCHASTIC PETRI NETS
L. A. Prisgrove and G. S. Shedler Mar. 1985 49 p
(Contract DAAG29-84-K-0030; Grant NSF MCS-82-03483)
(AD-A158348; TR-7; ARO-20927.7-MA) Avail: NTIS HC A03/MF A01 CSCL 12/1

A stochastic Petri net (SPN) provides a means for formal specification of a discrete event simulation. This document focuses on SPN's with special structure and define a symmetric SPN. Exploiting properties of a symmetric SPN and underlying regenerative process structure, the authors establish steady state estimation procedures based on independent, nonidentically distributed blocks. These results lead to efficient simulation methods for delay/throughput characteristics of ring networks. Author (GRA)

N86-15034# Stanford Univ., Calif. Dept. of Operations Research.
A JOINT CENTRAL LIMIT THEOREM FOR THE SAMPLE MEAN AND REGENERATIVE VARIANCE ESTIMATOR
P. W. Glynn and D. L. Iglehart Mar. 1985 22 p
(Contract DAAG29-84-K-0030; Grants NSF MCS-82-03483; NSF ECS-84-04809)
(AD-A158393; TR-6; ARO-20927.6-MA) Avail: NTIS HC A02/MF A01 CSCL 12/1

A bivariate central limit theorem is proved involving a point estimate for r and the asymptotic variance of this point estimate. This result can be applied immediately to the ratio estimation problem that arises in regenerative simulation. Numerical examples show that the variance of the regenerative variance estimator is not necessarily minimized by using the return state with the smallest expected cycle length. GRA

N86-15035# Naval Postgraduate School, Monterey, Calif.
SOME SIMPLE MODELS FOR CONTINUOUS VARIATE TIME SERIES
P. A. W. Lewis Jun. 1985 33 p
(RR0-1405)
(AD-A158451; NPS55-85-009) Avail: NTIS HC A03/MF A01 CSCL 12/1

A survey is given of recently developed mathematical models for continuous variate non-Gaussian time series. The emphasis is on marginally specific models with given correlation structure. Exponential, Gamma, Weibull, Laplace, Beta, and Mixed Exponential models are considered for the marginal distributions of the stationary time series. Most of the models are random coefficient, additive linear models. Some discussion of the meaning of autoregression and linearity is given, as well as suggestions for higher-order linear residual analysis for non-Gaussian models. Author (GRA)

N86-15036# Colorado Univ., Boulder. Boulder Dept. of Computer Science.
COMPUTATIONAL EXPERIENCE WITH CONFIDENCE REGIONS AND CONFIDENCE INTERVALS FOR NONLINEAR LEAST SQUARES
J. R. Donaldson and R. B. Schnabel May 1985 33 p
(Contract DAAG29-84-K-0140)
(AD-A158456; CU-CS-302-84; ARO-21453.2-MA) Avail: NTIS HC A03/MF A01 CSCL 12/1

This document presents the results of a Monte Carlo study of the most commonly discussed methods for constructing approximate confidence regions and confidence intervals for parameters estimated by nonlinear least squares. The methods we examine are the three variants of the linearization method, the likelihood method, and the lack-of-fit method. The linearization method is the most frequently implemented method. It is computationally inexpensive and produces easily understandable results. The likelihood and lack-of-fit methods both are much more expensive and more difficult to report. Based on our results, we conclude that among the three variants of the linearization method, the variant based solely on the Jacobian appears perferable because it is simpler, less expensive, more numerically stable, and at least as accurate as the other two variants which utilize the full Hessian. In our tests, however, all three variant of the linearization method often produce gross underestimates of confidence regions and sometimes produce significant underestimates of confidence intervals. Both the likelihood and lack-of-fit methods, on the other hand, perform very reliably. For datasets analyzed, the Bates and Watts curvature measures reliably predict when the linearization

method confidence regions will be poor, and for the most part are consistent with our results for the likelihood method. GRA

N86-15037# Iowa State Univ. of Science and Technology, Ames.
ORDER STATISTICS AND NONPARAMETRIC STATISTICS Final Report, 1 Apr. 1979 - 30 Jun. 1985
H. A. David 5 Aug. 1985 8 p
(Contracts DAAG29-79-C-0083; DAAG29-82-K-0136)
(AD-A158499; ARO-16137.26-MA; ARO-19018.17-MA) Avail: NTIS HC A02/MF A01 CSCL 12/1

The research reported falls under three headings: (1) order Statistics, (2) nonparametric statistics, (3) sequential Inference. The second edition of a research monograph and text Order Statistics was published. Topics investigated include the following: probability that a fuze will fire; moving order statistics, distribution theory and properties of the selection differential and related statistics; selection through an associated characteristic; Bahadur representation of sample quantiles; robust estimation in the presence of outliers. Properties of bootstrapping procedures were studied. A new approach to the Cramer-Smirnov test was developed. Sequential point estimation of the mean and properties of sequential estimation and testing are investigated. Author (GRA)

N86-15038# Stanford Univ., Calif. Lab. for Computational Statistics.
RECURSIVE PARTITIONING USING RANKS
M. R. Segal Aug. 1985 28 p
(Contract N00014-83-K-0472)
(AD-A158546; SU-LCS-TR-15) Avail: NTIS HC A03/MF A01 CSCL 12/1

Replacing the conventional splitting rules used in constructing regression trees by rules based on two sample rank statistics affords many advantages and equally poses some problems. Among the former are computational ease, invariance under monotone transformations of the response and worthwhile extension to censored data. The difficulties involve devising good pruning strategies in the absence of within node loss. These are addressed using look-ahead, bottom-up techniques. Some real-world and simulation performances of the methodology are presented. Author (GRA)

N86-15039# Purdue Univ., West Lafayette, Ind. School of Industrial Engineering.
RANDOM PROCESS GENERATION Final Report, 1 Oct. 1979 - 31 Dec. 1983
B. W. Schmeiser 19 Aug. 1985 12 p
(Contract N00014-79-C-0832)
(AD-A158638; RM-85-9) Avail: NTIS HC A02/MF A01 CSCL 12/1

The research topic was the probabilistic and statistical issues associated with simulating stochastic systems on digital computers. Throughout the duration of the project, results were obtained in the areas of input modeling and random variate generation, as indicated by the project title. During the last two years, results were also obtained in output analysis and variance reduction. Areas researched include: Input modeling the selection, fitting, and checking of probabilistic models of exogenous simulation variables used to drive simulation models; Random variate generation; Output analysis - the treatment of the data generated by the simulation model; and Variance reduction - the transformation from one simulation experiment to another for the purpose of obtaining better properties for the Monte Carlo estimator(s). GRA

N86-15040# Purdue Univ., West Lafayette, Ind. School of Industrial Engineering.
A FIVE-PARAMETER FAMILY OF PROBABILITY DISTRIBUTIONS, REVISION 1
B. W. Schmeiser and R. Lal Aug. 1985 26 p Prepared in cooperation with California State Univ.
(Contract N00014-79-C-0832)
(AD-A158645; RM-84-7-Rev-1) Avail: NTIS HC A03/MF A01 CSCL 12/1

A tractable, five-parameter family of continuous, unimodal probability distributions is developed. Special cases include the Bernoulli trial, uniform, power series, exponential, triangular and Laplace (double exponential) distributions. The family has closed-form density function, cumulative distribution function, inverse cumulative distribution function, hazard function, and residual moments. Statistical properties, parameter determination and random variate generation are discussed. Two numerical examples are given. GRA

N86-15041# California Univ., Berkeley. Operations Research Center.
RANDOM SEARCH FOR A PROBABLE OBJECT
W. S. Jewell Jun. 1985 21 p
(Grant AF-AFOSR-0122-81)
(AD-A158688; ORC-85-5) Avail: NTIS HC A02/MF A01 CSCL 12/1

A search is undertaken for an object thought to be present with an unknown probability, using a detection scheme whose efficiency is also uncertain. After a certain interval, the search is called off, with the object unfound; what are the posterior-to-experiment estimates of presence and detection efficiency? It is shown that those two unknown quantities interact in an interesting manner as the unsuccessful search goes on. Author (GRA)

N86-15042# Pennsylvania State Univ., University Park. Dept. of Statistics.
TESTS FOR PATTERNED ALTERNATIVES
T. P. Hettmansperger and R. M. Norton Aug. 1985 35 p
(Contract N00014-80-C-0741)
(AD-A158891; TR-56) Avail: NTIS HC A03/MF A01 CSCL 06/4

This paper treats the problem of testing for a patterned alternative in a one- or two-way layout. Ordered and umbrella alternatives are special cases. Statistics based on combined rankings and on pairwise rankings are developed. Modifications necessary to incorporate covariates are also included.
Author (GRA)

N86-15043# Stanford Univ., Calif. Lab. for Computational Statistics.
EXPERT SYSTEMS AND STATISTICAL EXPERTISE. PART 1: STATISTICAL EXPERT SYSTEMS Technical Report
N. S. Altman May 1985 29 p
(Contract N00014-83-K-0472)
(AD-A159503; SU-LCS-TR-17) Avail: NTIS HC A03/MF A01 CSCL 09/2

An expert system is a computer program at the level of a human expert in a complex but narrow field. Two types of expert systems which involve statistical expertise are statistical consulting programs and programs which find patterns in databases. Consulting programs can now be built quickly using programming tools. Twosamp, a consultant for advising on the analysis of univariate two-sample problems, was constructed in less than a week using one such tool, EMYCIN. Systems like Twosamp cannot model the initial stages of a consulting session, but can provide expert assistance on a class of models that has been selected. Consultants and pattern-finders can assist statisticians in building models, generating hypotheses, and maintaining complex databases. As well, they can serve as laboratories for experimentation with statistical strategies. Expert systems also use statistical expertise. Most systems include mechanisms for reasoning under uncertainty. Methods under investigation include fuzzy logic, Dempster-Shafer theory, Bayesian analysis and various ad hoc methods. Learning systems use statistics to infer inductive rules. As well, statistical reasoning will be used to evaluate the performance of expert systems. GRA

N86-15044# Stanford Univ., Calif. Dept. of Statistics.
REPEATED SIGNIFICANCE TESTS FOR EXPONENTIAL FAMILIES
I. Hu Aug. 1985 61 p
(Contract N00014-77-C-0306)
(AD-A159547; TR-34) Avail: NTIS HC A04/MF A01 CSCL 12/1

This report considered the significance levels and powers of repeated significance test (RTS). Typically these quantities cannot be calculated exactly and some sort of approximations are required. Satisfactory approximations of significance levels of RST for exponential families have been obtained by Lalley (1983) and Woodroofe (1978). In this report another method due to Siegmund (1985) in the special case of normal observations with known variance is developed. The main advantages that are claimed for this method are two-fold. First, it can be used to approximate the power of the RST. Second, it enables one to estimate both powers and significance levels of the modified RST. The approximations are also useful in determining confidence intervals. The proof of a nonlinear renewal theorem for conditional random walks and some numerical results are also given. Author (GRA)

N86-15045# Instituut TNO voor Wiskunde, Informatieverwerking en Statistiek, The Hague (Netherlands).
SOME PRACTICAL PROBLEMS IN ESTABLISHING FUNCTIONAL RELATIONSHIPS
A. A. M. Jansen Dec. 1983 20 p refs Presented at Workshop on Functional and Structural Relationships and Factor Analysis, Dundee, Scotland, 1 Sep. 1983
(Grant IWIS-07.6.A5814)
(B8565746) Avail: NTIS HC A02/MF A01

Linear relations and normally distributed departures with homogeneous variances and covariances as encountered in biometrical experiments are discussed. Experiment design and application of functional relationships to description and prediction are treated. Author (ESA)

N86-15046# Instituut TNO voor Wiskunde, Informatieverwerking en Statistiek, The Hague (Netherlands).
SUCCESSIVE MEASUREMENT EXPERIMENTS: ANALYSIS AND INTERPRETATION
Bertus Keen, Jac Thissen, Janneke Hoekstra, and Hans Jansen Apr. 1984 31 p refs
(Grant IWIS-06.17817)
Avail: NTIS HC A03/MF A01

A general model describing observations on a time process is presented. Statistical methods for successive measurements are weighted against this model. Four sources of variation are incorporated in the model: sampling variation, variation due to uncontrolled experimental conditions, measurement error, and error arising from the fact that the process is not observed continuously. Variation due to uncontrolled conditions is partially embedded in the fixed part of the model. Problems in interpretation due to these sources of variation are discussed. Applications of methods of analyzing successive measure experiments, using common methods such as analysis of variance and regression analysis, are described. Author (ESA)

N86-14407# Mitsui Bank, Tokyo (Japan). Systems Development Dept.
POWER OF SOMETIMES-POOL TEST PROCEDURES FOR FIXED EFFECT MODEL
Nobuo Ihara, Katsuji Uosaki (Osaka Univ.), and Masao Tasaka (Kobe Univ. of Commerce) *In* Okaka Univ. Technology Reports of the Osaka University, Vol. 35, Nos. 1800-1818 Oct. 1985 p 167-175 refs (For primary document see N86-14405 05-31)
Avail: NTIS HC A09/MF A01

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N86-15047*# PRC Kentron, Inc., Hampton, Va. Aerospace Technologies Div.
SYNTHETIC BOUNDS FOR SEMI-MARKOV RELIABILITY MODELS
Allan L. White Nov. 1985 12 p
(Contract NAS1-18000)
(NASA-CR-178008; NAS 1.26:178008) Avail: NTIS HC A02/MF A01 CSCL 12B

Upper and lower bounds are derived for the probability of failure for a class of highly reliable process control computers. The bounds are synthetic in the sense that the descriptions of component failure and system recovery are assumed to be obtained from different sources. The reliability model is constructed under the assumption that the processes are independent. Author

N86-15048# Center for Mathematics and Computer Science, Amsterdam (Netherlands).
FEW-DISTANCE SETS
A. Blockhuis 1984 80 p refs
(CWI-Tract-7; ISBN-90-6196-273-0) Avail: NTIS HC A05/MF A01

Problems of few-distance sets (FDS) of lines with few angles in the more general setting of an arbitrary product space, are studied. Several techniques (Koornwinder, Van Lint and Seidel) are described and used to obtain sharp bounded FDS in Euclidean and hyperbolic spaces. Gegenbauer polynomial formula and two versions of Frankl-Wilson (F-W) theorem are generalized. The F-W is applied to the description of Johnson schemes and properties of other (FDS modulo prime number) projective geometry spaces. The Erdos problem on isoceles set is solved and the fact that the converse is also true, is proved. Properties of the Zara graph in the polar spaces are studied. Author (ESA)

N86-14406# Kinki Univ., Kure (Japan). Dept. of Industrial Engineering.
STOCHASTIC LOCATION PROBLEM OF EMERGENCY SERVICE FACILITY
Tatsuo Matsutomi, Hiroaki Ishii (Osaka Univ.), and Toshio Nishida (Osaka Univ.) *In* Osaka Univ. Technology Reports of the Osaka University, Vol. 35, Nos. 1800-1818 Oct. 1985 p 157-166 refs (For primary document see N86-14405 05-31)
Avail: NTIS HC A09/MF A01

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N86-15049# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Pure Mathematics.
SPECIAL ORTHOGONAL POLYNOMIAL SYSTEMS MAPPED ONTO EACH OTHER BY THE FOURIER-JACOBI TRANSFORM
T. H. Koornwinder Jan. 1985 13 p refs Presented at the International Symposium on Orthogonal Polynomials and their Application, Bar-le-Duc, France, 15-18 Oct. 1984
(CWI-PM-R8501; B8565122) Avail: NTIS HC A02/MF A01

The Fourier-Jacobi transform, which generalizes the Mehler-Fock transform, is shown to map an orthogonal basis involving Jacobi polynomials onto an orthogonal basis involving Wilson polynomials. Limit cases include the Hankel transform mapping Laguerre functions onto itself, and the Whittaker transform mapping Laguerre functions to continuous dual Hahn polynomials. The orthogonal basis involving Jacobi polynomials tridiagonalizes the Jacobi function differential operator. Group theoretic interpretations are discussed. Full proofs are not given. Author (ESA)

N86-14923# Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Mechanical Engineering Aeronautical Engineering and Mechanics.
FINITE INCREMENT FORMULATION OF THE PRANDTL-REUSS CONSTITUTIVE EQUATIONS
R. L. Mallett *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing Feb. 1985 p 285-301 (For primary document see N86-14902 05-59)
(AD-P004922) Avail: NTIS HC A99/MF E03 CSCL 12/1

N86-14955# Army Concepts Analysis Agency, Bethesda, Md.
COMPUTING SETS
C. R. Leake *In* ARO Transactions of the 2nd Army Conference

on Applied Mathematics and Computing Feb. 1985 p 895-902 (For primary document see N86-14902 05-59)
(AD-P004956) Avail: NTIS HC A99/MF E03 CSCL 12/1

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics.* For astrophysics see *90 Astrophysics.* For solar physics see *92 Solar physics.*

N86-15050# California Univ., Berkeley. Lawrence Berkeley Lab.
RECENT ADVANCES IN THE TECHNOLOGY OF SUPERCONDUCTING ACCELERATOR MAGNETS
C. E. Taylor May 1985 5 p refs Presented at the Particle Accelerator Conference, Vancouver, British Columbia, 13 May 1985
(Contract DE-AC03-76SF-00098)
(DE85-017649; LBL-19903; CONF-850504-273) Avail: NTIS HC A02/MF A01

Recent progress in technology of high-current-density cables for SSC model magnets is summarized. NbTi cable with J sub c up to 50% higher than Tevatron cable can be expected. Magnetization effects can be predicted and corrected with several new techniques. Development of Superconductor with 2 to 3 (micro)m filament diameter and high J sub c is expected. DOE

N86-15051# California Univ., Berkeley. Lawrence Berkeley Lab.
MODEL EQUATIONS FOR HIGH CURRENT TRANSPORT
E. P. Lee Jun. 1985 11 p refs Presented at Orbital Dynamics and Applications To Accelerators Workshop, Berkeley, California, 7 Mar. 1985
(Contract DE-AC03-76SF-00098)
(DE85-016566; LBL-19798; CONF-8503105-7) Avail: NTIS HC A02/MF A01

The use of distribution functions to model transverse beam dynamics is discussed. Emphasis is placed on enveloped equations, moments, the Vlasov equation, and the Kapchinski-Vladimirskij distribution. DOE

N86-15052# Rome Univ. (Italy). Dipt. di Fisica.
SOLITONS [SOLITONI]
E. Calogero 14 Mar. 1985 27 p refs In ITALIAN Submitted for publication
(Preprint-446) Avail: NTIS HC A03/MF A01

The nonlinear phenomena described by the Korteweg and de Vries equation are discussed. The applications of the spectral transform is analyzed. The Schroedinger spectral problem is considered, and the temporal evolution and the class of integrable equations are studied. Solitons and solitrons are defined. Solitron is a generalized term applied to the case in which the collisions are not purely elastic. The applications of this solution technique are discussed. Author (ESA)

N86-14437# Joint Publications Research Service, Arlington, Va.
STATUS OF FUDAN VAN DE GRAAF REVIEWED
Yuan Daosheng, Fei Zhiyu, Lu Changrong, Sun Chuanchen, Ye Kezhong, Wu Peichun, Jin Jiangqiu, and Gu Yuanzhuang *In its* China Report: Science and Technology (JPRS-CST-85-027) 22 Aug. 1985 p 122-127 refs Transl. into ENGLISH from He Jishu (Shanghai), no. 2, Apr. 1985 p 22-24 (For primary document see N86-14433 05-31)
Avail: NTIS HC A09/MF A01

71 ACOUSTICS

Includes sound generation, transmission and attenuation. For noise pollution see *45 Environment Pollution.*

N86-15053 Kansas Univ., Lawrence.
01GENERAL AVIATION INTERIOR NOISE PROBLEM: SOME SUGGESTED SOLUTIONS Ph.D. Thesis
Ramasamy Navaneethan 1984 465 p
Avail: Univ. Microfilms Order No. DA8513813

The airborne noise transmission through aircraft sidewall is one of the important source, path combinations of the sound transmission into an aircraft cabin. A broad-based approach--i.e., laboratory investigation of sound transmission through panels, use of modern data analysis techniques and application to actual aircraft was used to determine methods to reduce general aviation interior noise. The experimental noise reduction characteristics of stiffened flat and curved panels with damping treatment are discussed. The experimental results of double-wall panels used in the general aviation industry are given. The effects of skin panel material, fiberglass insulation and trim panel material on the noise reduction characteristics of double-wall panels are investigated. These results are compared with the theoretical predictions from classical sound transmission theory for multilayered panels. The changes needed in the classical sound transmission theory for a better agreement are discussed. It is also shown that the same theory can successfully be used to design the interior noise control treatment of a new aircraft. Author

N86-15054 Maine Univ., Orono.
USE OF ULTRASONIC WAVEFORM DISTORTION TO MEASURE THE ACOUSTIC PARAMETER OF NONLINEARITY IN WATER, METHANOL, LIQUID NITROGEN AND LIQUID HELIUM Ph.D. Thesis
Heidar Ali Kashkooli 1984 133 p
Avail: Univ. Microfilms Order No. DA8513418

The waveform of an initially sinusoidal ultrasonic wave of appreciable amplitude, propagating in a liquid, is distorted. The degree of waveform distortion is determined by the acoustic nonlinearity parameter B/A, of the liquid. Two consequences of waveform distortion have been investigated in this study in order to determine the nonlinearity of the sound media. In the first experiment a laser beam incident at right angles to direction of sound propagation is diffracted by the sound wave. Because of the inhomogeneities in the refractive index of the liquid, caused by the distorted ultrasonic wave, the intensities of the diffracted orders are asymmetric with respect to zeroth order and depend upon the sound intensities. A technique which utilizes a digital signal averager is developed to plot the intensities of the diffracted orders as a function of the sound amplitude. These experimentally obtained curves are then best fitted to the theoretically predicted curves. The acoustic parameter of nonlinearity of the sound medium is obtained from the value of the fitting parameter. Dissert. Abstr.

N86-15055 Mississippi Univ., University.
SOUND AMPLIFICATION BY RELAXATION PROCESSES IN NITROGEN AND MIXTURES OF NITROGEN WITH HELIUM AND HYDROGEN Ph.D. Thesis
Dadang Iskandar 1985 96 p
Avail: Univ. Microfilms Order No. DA8514462

Experimental investigation of the sound amplification by relaxation processes in vibrationally excited gases has been made. Experiments were conducted in pure nitrogen and mixtures of nitrogen with helium and hydrogen. The nitrogen was vibrationally excited by an electrical discharge. A sound pulse, propagated through the excited gas under study, was Fourier analyzed to determine the absorption and velocity as a function of time and frequency. A numerical solution developed by Shields was used to calculate the absorption and velocity in unexcited gases. The observed and calculated absorption and velocity were then compared to determine the gain and temperature of the gas. In pure nitrogen and mixtures of nitrogen and helium, in which the vibrational relaxation time was much longer than the sound period, gain was not observed. Gain was observed in three cases: 50% He - 50% N2 at 40 Torr, 10% H2 - 90% N2 at 40 and 20 Torr. Dissert. Abstr.

N86-15056*# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
EVALUATION OF THE FEASIBILITY OF SCALE MODELING TO QUANTIFY WIND AND TERRAIN EFFECTS ON LOW-ANGLE SOUND PROPAGATION Final Report

G. S. Anderson, R. E. Hayden, A. R. Thompson, and R. Madden Jan. 1985 128 p refs
(Contract NAS1-16521)
(NASA-CR-172488; NAS 1.26:172488; BBN-5516) Avail: NTIS HC A07/MF A01 CSCL 20A

The feasibility of acoustical scale modeling techniques for modeling wind effects on long range, low frequency outdoor sound propagation was evaluated. Upwind and downwind propagation was studied in 1/100 scale for flat ground and simple hills with both rigid and finite ground impedance over a full scale frequency range from 20 to 500 Hz. Results are presented as 1/3-octave frequency spectra of differences in propagation loss between the case studied and a free-field condition. Selected sets of these results were compared with validated analytical models for propagation loss, when such models were available. When they were not, results were compared with predictions from approximate models developed. Comparisons were encouraging in many cases considering the approximations involved in both the physical modeling and analysis methods. Of particular importance was the favorable comparison between theory and experiment for propagation over soft ground. Author

N86-15057# Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Mathematical Sciences.
SENSITIVITY OF A PASSIVE TRACKING ALGORITHM TO INPUT VARIATIONS
W. L. Siegmann, M. J. Jacobson, and P. Bilazarian 15 Aug. 1985 53 p
(Contract N00014-76-C-0288)
(AD-A158453; RPI-MATH-153) Avail: NTIS HC A04/MF A01 CSCL 20/1

The sensitivity of a passive horizontal-tracking algorithm to variations in input measurements is investigated. The algorithm determines estimates for depth, range, bearing, horizontal speed, course, and frequency for a CW acoustic source moving with constant velocity at fixed depth. The receiver is a horizontal linear array towed at a constant depth. Both source and receiver move in the upper portion of a deep ocean and are separated by a relatively short range. Dominant acoustic signals are presumed to arrive along two upper-ocean ray paths. The algorithm uses a new combination of input quantities, including multipath information, Doppler frequency shifts, and array directional measurements. Procedures are developed for analyzing effects of input-measurement errors on source localization. The robustness of the algorithm to small variations in acoustic measurements and environmental parameters is demonstrated for a variety of source-receiver configurations. Variance estimates of position and motion are obtained in terms of input-measurement variances. Bounds on tracker performance are developed for measurements that are affected by noise. Results from the several types of analyses corroborate the sensitivity characteristics of the algorithm. GRA

N86-15058# Woods Hole Oceanographic Institution, Mass.
ON THE USE OF FOCUSED HORIZONTAL ARRAYS AS MODE SEPARATION AND SOURCE LOCATION DEVICES IN OCEAN ACOUSTICS
J. F. Lynch, D. K. Schwartz, and K. Sivaprasad 1985 11 p
(Contract N00014-82-C-0152)
(AD-A158709; WHOI-Contrib-5677) Avail: NTIS HC A02/MF A01 CSCL 17/1

Before one can use an array adaptively in a given environment, one must know its response to simple acoustic sources in that environment. The response of steered horizontal arrays and amplitude shaded vertical arrays to sources in a shallow water waveguide is well known. Indeed, such arrays are now eminently useful tools for both (modal) environmental studies and passive localization schemes. Recently, it was shown that one could also use focused horizontal arrays to do mode separation and source location in a shallow waveguide. This paper shows some of the highlights of recent work on the properties of focused arrays in shallow water. GRA

N86-15059# National Bureau of Standards, Gaithersburg, Md.
ACOUSTIC EMISSION TRANSDUCERS: CALIBRATION ACTIVITIES AND TRANSDUCER DEVELOPMENT Summary Report
F. R. Breckenridge, T. M. Proctor, M. Greenspan, and D. G. Eitzen 30 Aug. 1985 10 p
(Contract N00014-85-F-0017; RR0-1108)
(AD-A158906) Avail: NTIS HC A02/MF A01 CSCL 20/1

Based on recommendations by ASTM, ASME, and the AE Working Group, a facility for the calibration of AE sensors was developed. This development was partially supported by the Electric Power Research Institute and the Office of Naval Research. The calibration subjects the device under test to a known dynamic displacement in order to determine its sensitivity as a function of frequency. The first method implemented makes use of the surface-pulse configuration in which the mechanical input (a capillary-glass-break source which produces point-force step function) and the device under test are located on the same surface of a large transfer block which approximates a half-space. More recently, a through-pulse method has also been implemented; in this configuration the mechanical input and the device under test are centered on the transfer block on opposite surfaces. Transducers which measure dynamic surface displacement with high sensitivity and fidelity are being developed, modeled and evaluated by means of the calibration facility. Such transducers are needed as transfer standards for the secondary calibration of acoustic emission sensors, as a tool in developing signal processing techniques to characterize acoustic emission sources, and as transducers for field applications. GRA

N86-15060# Office of Naval Research, London (England).
HYDROACOUSTICS RESEARCH IN EUROPE Technical Report
P. Leehey 28 Aug. 1985 10 p
(AD-A159222; ONRL-R-5-85) Avail: NTIS HC A02/MF A01 CSCL 20/1

Hydroacoustics research is vigorous in Europe. Particularly the work in France and England overshadows that being done in the US. It appears that much more experimental work is needed to test the overwhelming amount of theory. GRA

N86-15061# Aeronautical Research Labs., Melbourne (Australia).
DETERMINATION OF THE DEPENDENCE OF ULTRASONIC SHEAR WAVE TRANSIT TIMES ON TEMPERATURES, STRESS AND FREQUENCY
S. J. Rumble and J. G. Sparrow Mar. 1985 30 p
(AD-A159468; AD-E440296; ARL/STRUC-TM-405) Avail: NTIS HC A03/MF A01 CSCL 20/12

The practical use of ultrasonics to determine residual stress requires a technique to separate the effects of texture and stress. This memorandum reports the results of a preliminary study of the temperature, stress and frequency dependence of ultrasonic shear wave transit times in a 2024T4 aluminium alloy sample. The acoustoelastic constant, the relative temperature coefficient and the texture induced anisotropy were found to be of the order .0001 /MPa, 0.001 /K and 0.01 respectively. Two techniques of separating the effects of texture and stress were investigated. These were the stress dependence of temperature coefficient and the frequency dependence of the birefringence. It was found that, within the precision of measurement, there was no stress dependence of the temperature coefficient of shear wave polarization parallel or perpendicular to the stress. The frequency dependence had a complex behavior which is not yet understood. GRA

N86-15062# Royal Australian Navy Research Lab., Edgecliff.
AN INVESTIGATION INTO THE EFFECT OF THE CORRELATION BETWEEN SEA-SURFACE ROUGHNESS AND DUCT-THICKNESS ON THE DISTRIBUTION OF ACOUSTIC PROPAGATION LOSS
M. Hall and R. T. Sandy May 1985 26 p
(AD-A159499; RANRL-TM-(EXT)-5/85) Avail: NTIS HC A03/MF A01 CSCL 20/1

Data were obtained and substituted into a model to test whether the distribution of the acoustic variable, propagation loss, is affected

by the correlation between the two oceanographic parameters, sea surface roughness and mixed-layer thickness. It was found that the correlation coefficient is only 0.1 and that the distribution of propagation loss is not affected by this correlation. GRA

N86-15063# Los Alamos National Lab., N. Mex.
SOUND SPEED MEASUREMENTS IN LIQUID LEAD AT HIGH TEMPERATURE AND PRESSURE
R. S. Hixson, M. A. Winkler, and J. W. Shaner 1985 14 p Presented at the 10th High Pressure Conference on Research in High Pressure Science and Technology, Amsterdam, Netherlands, 8 Jul. 1985
(Contract W-7405-eng-36)
(DE85-015673; LA-UR-85-2363; CONF-850759-12) Avail: NTIS HC A02/MF A01

Recently sound speed measurements in high temperature liquid lead have been made over a wide density range. Such measurements may be combined with other thermophysical properties measured with the isobaric expansion experiment (IEX) to yield several additional thermodynamic quantities. Results of calculations based on the sound speed measurements are presented, and their impact on liquid metal phenomenology is discussed. DOE

N86-15064# Centre Technique des Industries Mecaniques, Senlis (France).
ACOUSTIC RADIATION OF STRUCTURES IMMERSED IN AN INITIALLY QUIET GASEOUS MEDIUM Final Report [RAYONNEMENT ACOUSTIQUE DE STRUCTURES PLONGEES DANS UN GAZ INITIALLEMENT AU REPOS]
Y. Ousset and N. Sayhi Sep. 1984 50 p refs In FRENCH
(CETIM-11-R-030) Avail: NTIS HC A03/MF A01

The pressure field radiated by a vibrating body immersed in an infinite medium (air, water) is studied. The potential industrial applications include acoustic sources, noise attenuation and acoustic measurement. The equations suppose a harmonic excitation and a sound wave propagation in an obstacle-free medium. A finite element numerical approximation of the Helmholtz equation solution is described. A computer program in which the first phase of computation determines the potential densities by solving a variational formulation is described. Author (ESA)

N86-15065# Centre Technique des Industries Mecaniques, Senlis (France).
ANALYSIS AND CHARACTERIZATION OF DEFECTS BY ULTRASONIC REFLECTOMETRY AND DIFFRACTOMETRY Final Report [ANALYSE ET CARACTERISATION DES DEFAUTS PAR REFLECTOMETRIE ET DIFFRACTOMETRIE ULTRASONORE]
Y. Pralus Aug. 1984 22 p refs In FRENCH
(CETIM-15-H-237) Avail: NTIS HC A02/MF A01

A motorized device to control the attitude and translation of ultrasonic transducers; an electronic system to measure echo amplitude; a theoretical approach of the inverse problem in the interaction defect-acoustic wave; the realization of artificial defects by forging for research purposes; and the numerical treatment of the acoustic signals produced by the defects, including a computer program description are summarized. The complexity of the systems required do not allow industrial applications. Author (ESA)

N86-15066# Centre Technique des Industries Mecaniques, Senlis (France).
ACOUSTIC EMISSION CONTROL OF MULTIPASS WELDING DURING ITS EXECUTION Final Report [CONTROLE PAR EMISSION ACOUSTIQUE DE SOUDAGES MULTIPASSES EN COURS D'EXECUTION]
J. Roget 8 Jan. 1985 37 p refs In FRENCH
(CETIM-15-Y-121) Avail: NTIS HC A03/MF A01

Cold covering of transversal cracks and the flux inclusions in sclid flux welding of low alloy steel (18MD405) was studied. The results confirm the possibility of detecting these defects as soon as the covering pass is done. The identification and characterization of the defects requires further analysis of the acoustic signal. The space-time analysis used could be adapted to a real time monitoring system. Author (ESA)

N86-15067# Centre Technique des Industries Mecaniques, Senlis (France).
DAMAGE CONTROL BY ACOUSTIC EMISSION. SUMMARY OF RESULTS Final Report [CONTROLE ENDOMMAGEMENT PAR EMISSION ACOUSTIQUE. SYNTHESE DES RESULTATS OBTENUS]
J. P. Spieldenner, J. Roget, M. Cherfaoui (UTC), and J. F. Chretien (UTC) May 1984 45 p refs In FRENCH
(Contract DGRST-8-1-P-0589)
(CETIM-15-Y-143) Avail: NTIS HC A03/MF A01

The acoustic emissions from fatigue cracking in 2024 and 2618 aluminum alloys was studied to predict total failure and to improve damage models. The loads were intended to simulate actual loading in existing aircraft. Classical statistical methods and multidimensional analysis were employed to process the acoustic data. It is shown that acoustic emission can differentiate the various states of crack progression and that the extent of the cumulated damage can be estimated. Applications to measurement in aircraft are discussed. Author (ESA)

N86-15068# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
CIRCULATION MEASUREMENTS ON MACROSCOPIC VORTEX RINGS IN He2 USING ULTRASONIC SIGNALS Thesis [ZIRKULATIONSMESSUNGEN AN MAKROSKOPISCHEN RINGWIRBELN IN He 2 MIT HILFE VON ULTRASCHALLSIGNALEN]
M. vonSchwerdtner Oct. 1984 65 p refs In GERMAN
(MPIS-15/1984; ISSN-0436-1199) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlruhe, West Germany DM 19

An ultrasonic measuring system was developed to investigate the circulation and the translational motion of macroscopic vortex rings in liquid He2 at the point of exhaust from tubes. The measurement is based on the entrainment of sinusoidal first-sound waves by the center-of-mass flow of He2. The measurement of the phase modulation caused by the flow allows a determination of the circulation with an accuracy of 0.03 sqcm/sec. It is shown that the center-of-mass circulation and the translation velocity of the vortex ring have (independent of temperature) a behavior similar to that of a classical fluid, if the exhaust process lasts longer than 100 msec. During the translation of the vortices it is found that on the global decrease tendency of the circulation temporal variations are superposed, the magnitude of which depends on the exhaust time. The combination of first and second sound signals allows one to determine separately the normal and the superfluid velocity fields. Author (ESA)

N86-15069# Institut Franco-Allemand de Recherches, St. Louis (France).
TEST OF UTILIZATION OF AUDITORY FATIGUE AS AN INDICATOR OF INDIVIDUAL SUSCEPTIBILITY TO AUDITORY TRAUMATISM: STUDY ON GUINEA PIGS [ESSAI D'UTILISATION DE LA FATIGUE AUDITIVE COMME INDICATEUR DE LA SUSCEPTIBILITE INDIVIDUELLE AU TRAUMA ACOUSTIQUE. ETUDE CHEZ LE COBAYE]
R. Franke, K. Buck, and F. Devriere 10 Sep. 1984 122 p refs In FRENCH
(Contract DRET-79-353)
(ISL-R-118/84) Avail: NTIS HC A06/MF A01

The relationship between temporary auditory threshold shift (TTS) and permanent threshold shift (PTS) are investigated. An objective measurement method based on the recording of guinea pig global action potential was adopted. The animals were exposed to 103 dB noise, 5 min, 8 kHz, to follow the evolution of the TTS. An exposure to 110 dB, 30 minutes causes a PTS that was measured 14 days later. The results show that the maximum TTS is shifted one octave higher than average noise frequency, while the maximum PTS is not shifted. Author (ESA)

N86-14424# Yamaguchi Univ., Ube (Japan).
MEASUREMENT OF GRANULAR SURFACE PATTERN IN A

HOPPER BY ULTRASONIC WAVE SENSOR
Eiji Morimoto and Nobuo Hayano *In its* Memoirs of the Faculty of Engineering, Yamaguchi University, Vol. 36, No. 1 Oct. 1985 p 37-43 refs In JAPANESE; ENGLISH summary (For primary document see N86-14418 05-31)
Avail: NTIS HC A09/MF A01

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N86-15070*# Institute for Scientific Research, Winchester, Mass.
MOLECULAR PROCESSES IN A HIGH TEMPERATURE SHOCK LAYER Semiannual Status Report, 1 May - 31 Oct. 1984
Steven L. Guberman [1984] 8 p refs
(Contract NCC2-308)
(NASA-CR-176383; NAS 1.26:176383) Avail: NTIS HC A02/MF A01 CSCL 20H

Models of the shock layer encountered by an Aeroassisted Orbital Transfer Vehicle require as input accurate cross sections and rate constants for the atomic and molecular processes that characterize the shock radiation. From the estimated atomic and molecular densities in the shock layer and the expected residence time of 1 m/s, it can be expected that electron-ion collision processes will be important in the shock model. Electron capture by molecular ions followed by dissociation, e.g., O2(+) + e(-) yields O + O, can be expected to be of major importance since these processes are known to have high rates (e.g., 10 to the -7th power cu/cm/sec) at room temperature. However, there have been no experimental measurements of dissociative recombination (DR) at temperatures (> 12000K) that are expected to characterize the shock layer. Indeed, even at room temperature, it is often difficult to perform experiments that determine the dependence of the translational energy and quantum yields of the product atoms on the electronic and vibrational state of the reactant molecular ions. Presented are ab initio quantum chemical studies of DR for molecular ions that are likely to be important in the atmospheric shock layer. Author

N86-15071# Northwestern Univ., Evanston, Ill. Dept. of Materials Science and Engineering.
EFFECT OF INTERSTITIALS ON THE TRAPPING OF HYDROGEN IN HIGH PURITY IRON AS STUDIED BY POSITRON ANNIHILATION AND ELECTRON MICROSCOPY Final Report, 1 Oct. 1981 - 31 Aug. 1984
J. T. Waber and C. L. Snead, Jr. Mar. 1985 114 p
(Contract DAAG29-81-K-0153)
(AD-A158437; ARO-18342.17-MS) Avail: NTIS HC A06/MF A01 CSCL 07/4

This report summarizes research on the determination of: (1) the dislocation densities of both edge and screw components using two positron annihilation techniques; and (2) the density of hydrogen traps by analysis of electrolytic permeation measurements. Dislocation densities of single crystal iron specimens deformed in three different manners were in good agreement with disclocation densities obtained by ETCH-PIT and TEM methods on the same specimens as well as being bracketed by three earlier TEM investigations. The positron lifetimes were 114 psec. in the trap-free bulk, 165 in an edge and 142 in a screw dislocation. The first two of these values are in good agreement with values obtained several previous authors using poorly characterized specimens. It had been assumed that positron trapping in a screw dislocation was very unlikely - so the value for the latter type of dislocation is an important result. The binding energies of a hydrogen atom to an edge was deduced to be 37.4 and to a screw is 25.6 KJ/mole. The density of hydrogen at different strains was in good agreement with the number of dislocation traps. The occupancy sites along the dislocation was approximately 20%. GRA

N86-15072# Stevens Inst. of Tech., Hoboken, N. J. Dept. of Physics and Engineering Physics.
SURFACE PRODUCTION OF NEGATIVE HYDROGEN IONS Annual Report, 1 Jun. 1984 - 31 May 1985
M. Seidl 18 Jul. 1985 81 p
(Grant AF-AFOSR-0230-83)
(AD-A158949; AFOSR-85-0726TR) Avail: NTIS HC A05/MF A01 CSCL 20/8

Measurements of sputtering of adsorbed hydrogen by cesium ion bombardment have been completed. The temperature of the desorbed negative hydrogen ions is about 0.5 percent of the bombarding energy. An experiment for studying bombardment with cesium and hydrogen ions has been constructed. Formation of cesium coverage due to cesium bombardment of a molybdenum target has been studied. Cesium coverage is only weakly dependent on bombardment energy in the range from 100 to 500 eV. This is due to cesium ion implantation. GRA

N86-15073# Naval Postgraduate School, Monterey, Calif.
A SEARCH FOR X-RAY CERENKOV RADIATION M.S. Thesis
W. R. Fritchie Jun. 1985 58 p
(AD-A159540) Avail: NTIS HC A04/MF A01 CSCL 20/8

Cerenkov X-ray emissions should not exist in media where the index of refraction is less than unity. In previous work, X-ray Cerenkov radiation at the K=absorption edge of aluminum was reported to have been observed. The present experiment observed no X-ray Cerenkov radiation. However, radiation not characteristic of the Cerenkov mechanism was seen. The results of the experiment are provided. Various aspects of an experiment designed to investigate Cerenkov radiation in the X-ray region are also considered by exploring procedures, methods, equipment design and limitations. Suggestions for improvements to facilitate further experiments with media that allow the formation of Cerenkov radiation are provided. Author (GRA)

N86-15074# California Univ., Berkeley. Lawrence Berkeley Lab.
EFFECT OF RESONANT MICROWAVE POWER ON A PIG ION SOURCE, REVISION
I. G. Brown, J. E. Galvin, B. F. Gavin, and R. A. MacGill Aug. 1985 5 p Presented at Particle Accelerator Conference, Vancouver, British Columbia, 13 May 1985 Previously announced as N85-18673
(Contract DE-AC03-76SF-00098)
(DE85-016644; LBL-17827-Rev; CONF-850504-262-Rev) Avail: NTIS HC A02/MF A01

The effect of applying microwave power at the electron cyclotron frequency on the characteristics of the ion beam extracted from a hot-cathode Penning ionization gauge (PIG) ion source was investigated. No change was seen in the ion charge state distribution. A small but significant reduction in the beam noise level was seen, and it is possible that the technique may find application in situations where beam quiescence is important. (Author) DOE

N86-15075# Argonne National Lab., Ill.
PHONON EFFECT ON THE TEMPERATURE DEPENDENCE OF SPIN SUSCEPTIBILITY AND MAGNETIZATION IN METALS
D. J. Kim, C. Tanaka, and S. Ukon Jun. 1985 10 p Presented at the International Conference on Magnetism, San Francisco, California, 26 Aug. 1985 Prepared in cooperation with Aoyamagakuin Univ., Tokyo
(Contract W-31-109-eng-38)
(DE85-014962; CONF-850890-6) Avail: NTIS HC A02/MF A01

In many transition metals the paramagnetic spin susceptibility X increases with increasing temperature much beyond ordinary theories could account for. We demonstrate how the effect of the electron-phonon interactions enable us to understand such temperature dependence of X. DOE

N86-15076# California Univ., Berkeley. Lawrence Berkeley Lab.
Nu SHIFTS IN BETATRON OSCILLATIONS FROM UNIFORM PERTURBATIONS IN THE PRESENCE OF NON-LINEAR MAGNETIC GUIDE FIELDS

K. C. Crebbin May 1985 6 p refs Presented at the Particle Accelerator Conference, Vancouver, British Columbia, 13 May 1985
(Contract DE-AC03-76SF-00098)
(DE85-015248; LBL-18938; CONF-850504-233) Avail: NTIS HC A02/MF A01

Uniform magnetic field perturbations cause a closed orbit distortion in a circular accelerator. If the magnetic guide field is non-linear these perturbations can also cause a Nu shift in the betatron oscillations. Such a shift in radial Nu values has been observed in the Bevalac while studying the low energy resonant extraction system. In the Bevalac, the radial perturbation comes from the quadrants being magnetically about 0.8% longer than 90 deg. The normal effect of this type of perturbation is a radial closed orbit shift and orbit distortion. The Nu shift, associated with this type of perturbation in the presence of a non-linear guide field, is discussed in this paper. A method of handling the non-linear n values is discussed as well as the mechanism for the associated Nu shift. Computer calculations are compared to measurements. DOE

N86-15077# Argonne National Lab., Ill.
MECHANISMS OF ATOMIC AND MOLECULAR AUTOIONIZATION
J. Berkowitz 1985 12 p refs Presented at the 14th International Conference on the Physics of Electronic and Atomic Collisions, Palo Alto, Calif., 24 Jul. 1985
(Contract W-31-109-eng-38)
(DE85-017412; CONF-850701-2) Avail: NTIS HC A02/MF A01

We began a series of experiments on photoionization of open-shell atoms. We were motivated partly by two calculations of resonance structure in atomic Cl, one by the R-matrix method and the other by diagrammatic many-body perturbation theory (MBPT). In essence, the experimental arrangement for studying atomic Cl involves a microwave discharge in pure Clz, a fast flow system. A coating to retard recombination of the atomic Cl which is generated, and a sampling orifice. The first results are presented. B.W.

N86-15078# Mound Lab., Miamisburg, Ohio.
SAMPLING AND DATA-TAKING STRATEGIES IN X-RAY FLUORESCENCE ASSAY OF LOW S/N SOLUTIONS
C. R. Hudgens 1985 8 p refs Presented at the 34th Denver X-ray Conference, Denver, Colo., 1 Aug. 1985
(Contract DE-AC04-76DP-00053)
(DE85-017423; MLM-3289(OP); CONF-8508118-2) Avail: NTIS HC A02/MF A01

This projet was initiated for the purpose of demonstrating the feasibility of on-line X-ray fluorescence (XRF) analysis for the nondestructive assay of fissile elements (SNM) in reactor fuel reprocessing (dissolver) solutions, using wavelength dispersive X-ray fluorescence analysis because of its high immunity to the intense gamma emissions of the solutions. A prime objective of this project was the identification and dimensioning of the parameters critical to XRF assays of high accuracy. The concepts presented herein, though directed primarily to assay of solutions with emphasis on low signal-to-noise conditions and low count rates, are applicable to all assays of solids, slurries, and gases. This study shows that for solution analysis total sampling gives total mass assays with no need for solution density or tank volume measurements. Time savings and standard deviations are both benefited by systematically predetermining the count requirements of analysts, standards, and backgrounds by the use of equations based on propagation of error considerations. This becomes quite important when assaying dilute solutions, in which the signal-to-noise ratios of the X-ray intensities are very low. When counting times are long, short dwell times at each spectrometer setting significantly counteract error accumulation arising from long-term instrumental drift. DOE

N86-15079# California Univ., Berkeley. Lawrence Berkeley Lab.
WOBBLER FACILITY FOR BIOMEDICAL EXPERIMENTS AT THE BEVALAC
W. T. Chu, S. B. Curtis, J. Llacer, T. R. Renner, and R. W. Sorensen May 1985 6 p refs Presented at the Particle Accelerator Conference, Vancouver, British Columbia, 13 May 1985
(Contract DE-AC03-76SF-00098)
(DE85-017641; LBL-18953; CONF-850504-276) Avail: NTIS HC A02/MF A01

A new wobbler facility has been developed to deliver large uniform fields of relativistic heavy ions at the Bevalc without resorting to the use of scattering material in the beam. The charged particle beams are made to wobble and paint a ring at the target by a pair of dipole magnets, which are placed tandem with their fields orthogonal to each other. The magnets are powered sinusoidally 90 deg out of phase with each other. By superimposing several rings of appropriate sizes and intensities, large uniform fields are produced. Up to 30 cm diameter fields with less than 5% variation in uniformity have been achived. Physics and biology measurements have been made to characterize the radiation field. DOE

N86-15080# California Univ., Berkeley. Lawrence Berkeley Lab.
METAL VAPOR VACUUM ARC (MEVVA) HIGH CURRENT ION SOURCE
I. G. Brown May 1985 7 p refs Presented at the Particle Accelerator Conference, Vancouver, British Columbia, 13 May 1985
(Contract DE-AC03-76SF-00098)
(DE85-017642; LBL-18963; CONF-850504-275) Avail: NTIS HC A02/MF A01

An ion source is described in which a metal vapor vacuum arc is used to create the plasma from which the ions are extracted. Beams of a variety of ions have been produced, ranging from lithium up to uranium. At an extraction voltage of 25 kV we've measured an ion beam current of over 1 Ampere, with over 550 ema of the beam in an emittance of 0.07(PI) cm. mradians (normalized). The ion charge state distribution varies with cathode material and with arc power; for uranium a typical distribution is peaked at U(5+), with up to 40% of the beam current in this charge state. DOE

N86-15081# California Univ., Berkeley. Lawrence Berkeley Lab.
COMPACT HEAVY ION RFQ PREACCELERATOR FOR USE AT THE CERN LINAC I
R. A. Gough, J. Staples, R. Caylor, D. Howard, R. A. MacGill, and J. Tanabe May 1985 6 p refs Presented at the Particle Accelerator Conference, Vancouver, British Columbia, 13 May 1985
(Contract DE-AC03-76SF-00098)
(DE85-017643; LBL-18966; CONF-850504-277) Avail: NTIS HC A02/MF A01

This paper describes the LBL contribution to a project designed to provide fully-stripped oxygen beams for acceleration in the CERN PS complex. A preaccelerator for Linac I consisting of an ECR ion source, an RFQ linac, and RF matching cavities is being assembled as part of a collaborative arrangement among LBL, GSI, and CERN. The RFQ, designed and built at LBL, will accept analyzed oxygen +6 beam from the ECR at 5.6 keV/amu, and accelerate it to 139.5 keV/amu, the injection energy required for 2 (BETA)lambda operation of Linac I. Stripping to +8 will be done with a foil stripper at 12.5 MeV/amu at the exit of Linac I. The RFQ operates at 202.56 MHz and is 0.86 meters in length. The structure is stabilized with vane coupling rings, and uses a single drive loop and a single tuning loop. DOE

N86-15082# California Univ., Berkeley. Lawrence Berkeley Lab.
BEAM PROFILE MONITOR SYSTEM FOR THE BEVALAC TRANSFER LINE
G. Stover May 1985 6 p refs Presented at the Particle Accelerator Conference, Vancouver, British Columbia, 13 May 1985
(Contract DE-AC03-76SF-00098)
(DE85-017669; LBL-18962; CONF-850504-279) Avail: NTIS HC A02/MF A01

Incorporated in the current Bevalac transfer line upgrade project

is a proposal for a new electronic beam monitoring system. It will be designed to amplify, convert, and transmit the signals of twelve 16 by 16 multi-wire grids to a central computer located in the Bevatron control room. Each station will contain interface amplifiers and a local microprocessor to convert wire grid currents into digitized values which will then be transmitted via a serial data channel to the main computer. The system will have a large dynamic range (1 nano to 1 milli-ampere of beam current), be designed for distributed operation, and will be easily expandable. This paper describes the basic electronic hardware and software components of the proposed system. DOE

N86-15083# Los Alamos National Lab., N. Mex.
SIMULATIONS OF VIBRATIONAL RELAXATION IN DENSE MOLECULAR FLUIDS
B. L. Holian Jul. 1985 35 p Presented at the International School of Physics on Molecular Dynamics Simulation of Statistical Mechanical Systems, Varenna, Italy, 23 Jul. 1985
(Contract W-7405-eng-36)
(DE85-015748; LA-UR-85-2583; CONF-850764-5) Avail: NTIS HC A03/MF A01

In the understanding of high-temperature and -pressure chemistry in explosives, the first step is the study of the transfer of energy from translational degrees of freedom into internal vibrations of the molecules. We present new methods using nonequilibruim molecular dynamics (NEMD) for measuring vibrational relaxation in a diatomic fluid, where we expect a classical treatment of many-body collisions to be relevant because of the high densities (2 to 3 times compressed compared to the normal fluid) and high temperatures (2000 to 4000 K) involved behind detonation waves. NEMD techniques are discussed, including their limitations, and qualitative results presented. DOE

N86-15084# Los Alamos National Lab., N. Mex.
HIGH-BRIGHTNESS, HIGH-CURRENT ION SOURCES
R. Keller 1985 16 p Presented at the Workshop on High Brightness, High Current, High Duty Factor Ion Injectors, San Diego, Calif., 21 May 1985
(Contract W-7405eng-36)
(DE85-015690; LA-UR-85-1626; CONF-8505164-2) Avail: NTIS HC A02/MF A01

Several existing high-current dc ion sources are presented that yield positive ions and are based on gas discharges. Their common features are then outlined: extraction systems, required plasma qualities, and the production of ions from solid materials. Finally, from well-established laws, scaling rules for high-brightness ion beams are derived taking one specific case to determine the numerical constants. These rules predict that the current values of transportable beams scale proportionally to the 3/2 power of the extraction voltage, whereas the brightness strongly decreases with rising voltage. DOE

N86-15085# Los Alamos National Lab., N. Mex.
CALCULATION OF THE MUTUAL DIFFUSION COEFFICIENT BY EQUILIBRIUM AND NONEQUILIBRIUM MOLECULAR DYNAMICS
J. J. Erpenbeck and J. M. Kincaid 1985 26 p Presented at the 9th Symposium on Thermophysics Properties, Boulder, Colo. 24 Jun. 1985 Prepared in cooperation with National Bureau of Standards, Washington, D.C.
(Contract W-7405-eng-36)
(DE85-015703; LA-UR-85-2500; CONF-850617-3) Avail: NTIS HC A03/MF A01

A nonequilibrium molecular dynamics method for the calculation of the mutual diffusion coefficient for a mixture of hard spheres is described. The method is applied to a 50-50 mixture of equidiameter particles having a mass ratio of 0.1 for the two species, at a volume of three times close-packing. By extrapolating the results to the limit of vanishing concentration gradient and infinite system size, we obtain a value in statistical agreement with the result obtained using a Green-Kubo molecular dynamics procedure which is also described. The nonequilibrium calculation yields a mutual diffusion coefficient which decreases slightly with increasing concentration gradient. The Green-Kubo time correlation function for mutual diffusion displays a slow decay with time, qualitatively similar to the long-time tail which has been predicted by the hydrodynamic theory of Pomeau. DOE

N86-15086# Los Alamos National Lab., N. Mex.
GAS CELL NEUTRALIZERS (FUNDAMENTAL PRINCIPLES)
B. Fuehrer Jun. 1985 38 p Presented at the Neutralizer Workshop, Upton, N.Y., 5 Jun. 1985
(Contract W-7405-eng-36)
(DE85-015747; LA-UR-85-2595; CONF-8506150-2) Avail: NTIS HC A03/MF A01

Neutralizing an ion-beam of the size and energy levels involved in the neutral-particle-beam program represents a considerable extension of the state-of-the-art of neutralizer technology. Many different mediums (e.g., solid, liquid, gas, plasma, photons) can be used to strip the hydrogen ion of its extra electron. A large, multidisciplinary R and D effort will no doubt be required to sort out all of the pros and cons of these various techniques. The purpose of this particular presentation is to discuss some basic configurations and fundamental principles of the gas type of neutralizer cell. Particular emphasis is placed on the Gasdynamic Free-Jet neutralizer since this configuration has the potential of being much shorter than other types of gas cells (in the beam direction) and it could operate in nearly a continuous mode (CW) if necessary. These were important considerations in the ATSU design which is discussed in some detail in the second presentation entitled ATSU Point Design. DOE

N86-15087# Lawrence Livermore National Lab., Calif.
ELECTROMAGNETIC EFFECTS IN RELATIVISTIC ELECTRON BEAM PLASMA INTERACTIONS
W. L. Kruer and A. B. Langdon 13 Feb. 1985 8 p refs Presented at the 2nd International Workshop on Laser Acceleration of Particles, Los Angeles, Calif., 7 Jan. 1985
(Contract W-7405-eng-48)
(DE85-016071; UCRL-92172; CONF-850128-13) Avail: NTIS HC A02/MF A01

Electromagnetic effects excited by intense relativistic electron beams in plasmas are investigated using a two-dimensional particle code. The simulations with dense beams show large magnetic fields excited by the Weibel instability as well as sizeable electromagnetic radiation over a significant range of frequencies. The possible relevance of beam plasma instabilities to the laser acceleration of particles is briefly discussed. DOE

N86-15088# Oak Ridge National Lab., Tenn.
ANALYSIS OF NEUTRON DATA IN THE RESONANCE REGION VIA THE COMPUTER CODE SAMMY
N. M. Larson 1985 4 p Presented at the International Conference on Nuclear Data for Basic and Applied Science, Santa Fe, N. Mex., 13 May 1985
(Contract DE-AC05-84OR-21400)
(DE85-011936; CONF-850507-12) Avail: NTIS HC A02/MF A01

Procedures for analysis of resonance neutron cross-section data have been implemented in a state-of-the-art computer code SAMMY, developed at the Oak Ridge Electron Linear Accelerator (ORELA) at Oak Ridge National Laboratory. A unique feature of SAMMY is the use of Bayes' equations to determine best values of parameters, which permits sequential analysis of data sets (or subsets) while giving the same results as would be given by a simultaneous analysis. Another important feature is the inclusion of data-reduction parameters in the fitting procedure. Other features of SAMMY are also described. DOE

N86-15089# South Carolina Univ., Columbia.
ELECTRON POSITRON ANNIHILATION FROM 3 TO 11 GeV, ARGUS REPORT 1984 Progress Report
C. Darden, III 1985 17 p
(Contract DE-AS09-80ER-10690)
(DE85-009814; DOE/ER-10690/T1) Avail: NTIS HC A02/MF A01

The ARGUS detector and the e(+)e(-) storage ring DORIS at

DESY are used to investigate particles produced by the mutual annihilation of the e(+) and e(-), including members of the upsilon family of mesons which are produced resonantly in the ring, and charm mesons, baryons, and charged leptons, which are produced nonresonantly. The ring delivered luminosity at the upsilon (2S), upsilon(4S), upsilon(1S), and a small amount in the continuum. Results are briefly reviewed on the decay of D*(+-) and F(+-) mesons. It was found that antideuterons were produced in e(+)e(-) annihilation at 10 GeV. Evidence was found for the F* meson. Evidence was sought for the zeta particle. A fast processor was added to reduce dead time. The performance of the vertex drift chamber, beam pipe, inner compensation coils, main drift chamber, time of flight, shower and muon counters, and the storage ring are reviewed. DOE

N86-15090# Chicago Univ., Ill.
BASIC STUDIES OF ATOMIC DYNAMICS Technical Progress Report, 1 Aug. 1984 - 30 Jun. 1985
U. Fano 1 Jul. 1985 13 p refs
(DE85-015035; DOE/ER-01674/10) Avail: NTIS HC A02/MF A01

A procedure was developed to represent the critical propagation of wave functions on potential ridges by constructing and superposing approximate wave functions that represent Wannier's diverging and converging modes. This procedure also serves to represent optimized adiabatic propagation in potential valleys and is designed for application to reactive collisions as well as to spectra. The pilot studies of the effect of channel coupling in open valence shells has been completed very successfully. Its method is now available for application throughout the periodic system, to collsions as well as to spectra. Renewed analysis of the theory of atomic orientation by electron collisions is providing new insights. DOE

N86-15091# Los Alamos National Lab., N. Mex.
TIME-RESOLVED CURRENT, CURRENT-DENSITY, AND EMITTANCE MEASUREMENTS OF THE PHERMEX ELECTRON BEAM
D. C. Moir, L. A. Builta, and T. P. Starke 1985 4 p Presented at the Particle Accelerator Conference, Vancouver, British Columbia, 13 May 1985
(Contract W-7405-eng-36)
(DE85-012708; LA-UR-85-1652; CONF-850504-133) Avail: NTIS HC A02/MF A01

The PHERMEX electron-beam pulse is a burst of ten 3.3-ns micropulses separated by 20 ns. Typical accelerator operating parameters produce a mean beam micropulse energy of 26 MeV with peak current of 300 to 500 A. The purpose is to present experimental measurements of the current, current density, and emittance of a single PHERMEX micropulse. This experiment is part of an effort to completely characterize the PHERMEX electron beam. Understanding the electron-beam parameters is necessary for machine upgrade as related to flash radiography and for both present and future electron-beam experiments. DOE

N86-15092# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
PRIMARY PROCESSES OF ELECTRONICALLY EXCITED PARTICLES. RELAXATION OF RATIONAL DISTRIBUTIONS [PRIMAERPROZESSE ELEKTRONISCH ANGEREGTER TEILCHEN IV. RELAXATION VON ROTATIONSVERTEILUNGEN]
W. Hack and W. Langel Dec. 1983 102 p refs In GERMAN
(MPIS-13/1983; ISSN-0436-1199) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 23

A mathematical model to determine the shock-induced relaxation of rotational distributions not in equilibrium with their environment was made. The distributions are presented as step functions with their dependence on the rotational energy. Starting from initial distributions determined from experimental data, intermediate distributions were calculated by integration of the master equations. The energy relaxation of all examined systems can be described by a linear differential equation. The characteristics of the coefficient matrix of the master equations are discussed. The calculated systems can be divided in two groups depending on their relaxation behavior, the first for which the shock-transferred rotational energy is small, the second for which this energy is large compared to a rotational quantum. Author (ESA)

N86-15093# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
INVESTIGATION OF THE REACTIONS OF ELECTRONICALLY EXCITED MOLECULES WITH ATOMS AND RADICALS IN THE GAS PHASE Thesis [UNTERSUCHUNGEN DER REAKTIONEN VON ELEKTRONISCH ANGEREGTEN MOLEKUELEN MIT ATOMEN UND RADIKALEN IN DER GASPHASE]
H. Kurzke Feb. 1985 153 p refs In GERMAN
(MPIS-2/1985; ISSN-0436-1199) Avail: NTIS HC A08/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 32

Reactions between metastable electronic states of atoms and molecules in the system nitrogen-hydrogen were investigated with respect to reaction product and velocity constants for the examination of air pollution. The reactions were conducted in isothermal flow systems equipped with opticospectroscopical apparatus. The absolute concentrations of H and O atoms were determined by resonance absorption; the concentrations of radicals by laser-induced fluorescence. The Arrhenius parameter of the reactions between NH2 radicals and hydrocarbons and acetaldehyde was measured in a broad temperature domain. Reaction velocity constants were determined in flow systems with different surface to volume ratios. Radicals and atoms were observed in reactions. The temperature dependence of reactions was determined. The error of measured velocity constants is discussed.
Author (ESA)

N86-14436# Joint Publications Research Service, Arlington, Va.
INR 30MeV SECTOR FOCUSED CYCLOTRON DETAILED
Chang Hongjun *In its* China Report: Science and Technology (JPRS-CST-85-027) 22 Aug. 1985 p 115-121 Transl. into ENGLISH from He Jishu (Shanghai), no. 2, Apr. 1985 p 12-21 (For primary document see N86-14433 05-31)
Avail: NTIS HC A09/MF A01

N86-14445# Joint Publications Research Service, Arlington, Va.
DIFFERENTIAL ELASTIC SCATTERING CROSS SECTIONS OF 14.2 MeV NEUTRONS FROM NIOBIUM
Jingde Li, Daquan Xie, Yexiang Li, Di Zhang, Shiming Wang, and Jianhua Cao *In its* China Report: Science and Technology (JPRS-CST-85-036) 23 Oct. 1985 p 27-34 refs Transl. into ENGLISH from Yuanzihe Wuli (Beijing), v. 7, no. 2, May 1985 p 106-111 (For primary document see N86-14443 05-31)
Avail: NTIS HC A07/MF A01

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

N86-15094# Saint Louis Univ., Mo. Dept. of Earth and Atmospheric Sciences.
LG WAVE EXCITATION AND PROPAGATION WITH APPLICATION TO NUCLEAR YIELD DETERMINATION Final Report, 1 Apr. 1983 - 31 Mar. 1985
R. B. Herrmann and C. Y. Wang 28 May 1985 77 p
(Contract F49620-83-C-0087; ARPA Order 4751)
(AD-A158390; AFOSR-85-0581TR) Avail: NTIS HC A05/MF A01 CSCL 08/11

Malin's (1980) first-order single scattering theory has been extended to study the scattering of surface waves as well as body waves by distributed point scatterers in a layered medium. The scattered waveform itself is generated and examined instead of its energy envelope. The theory used allows: (1) mode conversion; (2) wave type conversion; (3) finite scatterer distribution; and (4) the effect of attenuation from scattering as well as intrinsic

absorption. The cases studied are for elastic or slightly attenuative media with any kind of source and receiver at any place in the layered structure. This direct calculation of coda waves provides us an immediate description of the relation of coda and scattering. The objectives are to find (1) the effect of layering on scattering; (2) the effect of scatterer distribution on recorded vertical and horizontal motion; (3) the relation of scattering Q to intrinsic Q; (4) the scattering behavior of surface and body waves; and (5) the superposition of scattering waves to form the coda. The generation of body waves by locked mode approximation, which makes the body wave a subset of the surface wave, is extensively studied. GRA

N86-15095# Teledyne Geotechnical, Alexandria, Va. Alexandria Lab.
FINITE DIFFERENCE CRATERING SUPPORT. MAGNITUDE DETERMINATION OF CRATERING AND NON-CRATERING NUCLEAR EXPLOSIONS Final Technical Report, on Task 1
K. L. McLaughlin, I. N. Gupta, and R. Wagner May 1985 42 p
(Contract MDA903-84-C-0289)
(AD-A158673; TGAL-85-3) Avail: NTIS HC A03/MF A01 CSCL 08/11

The ratio of the a phase and max phase of presumed Shagan River contained and cratering explosions are studied across the WWSSN network of short period stations. The amplitude of the a phase of the presumed cratering explosion of Jan 15, 1965 is found to be systematically larger in comparison to the max amplitude of this cratering explosion when compared to contained explosions in the vicinity of the cratering explosion. The log of the ratio of the amplitudes of the a and max phase, log(Pmax/Pa), is on average smaller for the Jan 15, 1965 cratering explosion than for any of the contained explosions studied. Several methods were used to study the systematics of the log(Pmax/Pa) value across the WWSSN network. The preferred method for determinig the average log(Pmax/Pa) was a maximum-likelihood method that includes the effects of data truncation of clipping for Pmax and non-detection of Pa. Assuming that the a phase amplitude of the cratering explosion is unaffected by the influence of the non-linear free surface interaction, the corrected magnitude for the cratering explosion is 0.17 to 0.27 magnitude units larger than its 5.88 WWSSN network magnitude. If the cratering explosion is credited with a yield of 125 KT then a 125 KT contained explosion in the Shagan River test site should produce a WWSSN network m sub b between 6.05 to 6.15. GRA

N86-15096# Argonne National Lab., Ill.
RELATIVISTIC MULTIPLE SCATTERING THEORIES
F. Coester 1985 14 p refs Presented at the Symposium on Medium Energy Nucleon and Antinucleon Scattering, Bad Honnef, West Germany, 18 Jun. 1985
(Contract W-31-109-eng-38)
(DE85-014986; CONF-8506162-1) Avail: NTIS HC A02/MF A01

The conventional nonrelativistic nuclear many-body dynamics can be embedded in a Lorentz invariant dynamics with the same degrees of freedom. The qualitative features responsible for the agreement of such a theory with nucleon-nucleus scattering data are the same as for the nonrelativistic theory. Relativistic effects (i.e., the consequences of Lorentz invariance) can be investigated quantitatively. For medium-energy proton beams these relativistic effects are expected to be small. However, the requirements of Lorentz invariance do not determine the nuclear dynamics, or even severely restrict its form. Dirac phenomenology, as well, is consistent with minimal requirements of relativistic quantum theory: (1) The existence of a Hilbert space of states on which Lorentz transformations and translations are implemented by unitary operators; (2) Positivity of the energy spectrum. It is also compatible with the fact that nucleons are composites of quarks, and its success does not imply that antinucleon degrees of freedom play a prominent role in medium-energy nucleon-nucleus scattering. DOE

N86-15097# General Electric Co., Sunnyvale, Calif. Nuclear Systems Technology Operation.
SP-100 SURETY EVALUATION
Jun. 1985 176 p
(Contract DE-AT03-84SF-12209)
(DE85-015502; DOE/SF-12209/T1) Avail: NTIS HC A09/MF A01

This report describes surety evaluations conducted during GFY 1985 in support of the General Electric design for a Space Nuclear Power System - SP-100. Those surety evaluations address both safety and safeguards requirements, which are derived from OSNP-1 and supporting documents. The report includes results of neutronics (criticality) calculations performed by Los Alamos. The results have been benchmarked against independent calculations performed by General Electric with different codes. These comparisons show close agreement, and are summarized. Los Alamos has also provided specifications of explosion and fire environments, which have been used in evaluation of the GE SP-100 concept. Following the summary of key results, surety requirements are given and recommendations toward specification of requirements for later SP-100 project phases are presented. A conceptual design summary is presented. To establish a comprehensive background for surety evaluations, a reference mission profile and potential accidents for each phase of the mission are identified. The main body of the report addresses surety of the General Electric Thermoelectric Conversion design. GE has also developed a Stirling Engine concept, and performed comprehensive surety evaluations for it. These evaluations are reported. DOE

N86-15098# Los Alamos National Lab., N. Mex.
STUDY OF RARE MUON DECAY MODES WITH THE CRYSTAL BOX
V. Sandberg, R. D. Bolton, J. D. Bowman, R. D. Carlini, M. D. Copper, M. Doung-Van, J. S. Frank, A. L. Hallin, P. Heusi, and C. M. Hoffman 1985 43 p Presented at the General Meeting of the American Physical Society, Washington, D.C., 25 Apr. 1985 Prepared in cooperation with Chicago Univ., IL.; Stanford Univ., CA.; Temple Univ., Philadelphia, PA.
(Contract W-7405-eng-36)
(DE85-015678; LA-UR-85-2346; CONF-850414-1) Avail: NTIS HC A03/MF A01

We report on a search for the lepton family-number-nonconserving decays (MU)(+)(YIELDS)e(+)e(-)e(+), (MU)(+)(YIELDS)e(+)(GAMMA), and (MU)(+)(YIELDS)e(+)(GAMMA)(GAMMA), using the Crystal Box detector at LAMPF. The experiment was run in the stopped muon channel at LAMPF during the winter and summer of 1984. Muons were stopped in the middle of a detector system consisting of a cylindrical drift chamber, a plastic scintillator hodoscope, and a segmented array of sodium iodide crystals. The sodium iodide surrounded the hodoscope and drift chamber. Events consistent with any of the above decays were recorded. The off-line data analysis imposed requirements on the timing, vertex location, and energy and momentum conservation for each event. Radioactive sources, conventional muon decay spectra, and photons from the process (PI)(-)p(YIELDS)n(GAMMA) and (PI)(-)p(YIELDS)n(PI)(0) were used to provide energy calibration and resolution estimates. The inner bremsstrahlung processes (MU)(+)(YIELDS) e(+)(GAMMA)(NU)anti(NU) and (MU)(+)(YIELDS)e(+)e(-)e(+)(NU)anti(NU) were observed at the expected rates. Details of the detector, the data analysis, and our latest bounds for the branching ratios will be presented. DOE

N86-15099# Los Alamos National Lab., N. Mex.
ATSU POINT DESIGN (GASDYNAMICS)
B. Fuehrer Jun. 1985 32 p Presented at the Neutralizer Workshop, Upton, N.Y., 5 Jun. 1985
(Contract W-7405-eng-36)
(DE85-015746; LA-UR-85-2596; CONF-8506150-3) Avail: NTIS HC A03/MF A01

In this presentation the basic principles outlined in the first talk Gas Cell Neutralizers will be applied to a problem of particular interest, i.e., the design of a gasdynamic free-jet neutralizer for the Los Alamos ATSU project. What will be presented here does not in any way represent the final gas neutralizer design for ATSU.

Rather, the material presented herein should be viewed as simply a preliminary design intended to identify and gain insight into the more subtle issues that must be considered in designing this type of gas neutralizer. DOE

N86-15100# Stanford Research Inst., Menlo Park, Calif.
SIXTH QUARK: PROCEEDINGS
P. M. McDonough, ed. Jan. 1985 761 p Presented at the 12th SLAC Summer Institute on Particle Physics, Stanford, California, 23 Jul. 1984
(Contract DE-AC03-76SF-00515)
(DE85-015805; SU-SLAC-281; CONF-8407112) Avail: NTIS HC A99/MF A01

Separate abstracts were prepared for 34 papers in this conference proceedings. DOE

N86-15101# Texas Univ., Austin. Center for Particle Theory.
ANOMALOUS PHOTON INTERACTIONS
D. A. Dicus and X. Tata Jan. 1985 10 p refs Prepared in cooperation with European Organization for Nuclear Research, Geneva, Switzerland
(Contract DE-AS05-76ER-03992)
(DE85-016112; DOE/ER-03992/2; CERN-TH-4090/85) Avail: NTIS HC A02/MF A01

It is pointed out that many models of the radiative decay of the Z(0) boson would necessitate a new two photon-two lepton effective interaction in an SU(2) x U(1) invariant theory. We study the effect of this interaction and show that its effect is negligible in QED processes at present energies. Possibilities of detecting it at future colliders are also discussed. DOE

N86-15102# California Univ., Berkeley. Lawrence Berkeley Lab.
COHERENT INSTABILITY AND ION TRAPPING CONSIDERATIONS FOR ALADDIN LATTICES
S. Chattopadhyay May 1985 45 p refs
(Contract DE-AC03-76SF-00098)
(DE85-016494; LBL-19281) Avail: NTIS HC A03/MF A01

This paper presents the results of an investigation of the effects of ions and coherent collective instabilities on bunched electron beams circulating in the various Aladdin lattices considered in the Aladdin Upgrade Study. It is aimed particularly at identifying those collective and ion phenomena that may be limiting the performance of the present Aladdin with low energy (100 MeV) injection, at ascertaining which of these phenomena would still remain and limit the performance with a full energy (800 MeV) injector for any correction schemes (either active or passive) to alleviate the performance impact of these phenomena; overview of the behavior at low and high energy (and current), the dependence of this behavior on the RF frequency, and the resulting implications for the upgraded Aladdin operations will emerge in the course of this report. DOE

N86-15103# California Univ., Berkeley. Lawrence Berkeley Lab.
NEW EXPERIMENTS ON FEW-ELECTRON VERY HEAVY ATOMS
H. Gould Jul. 1985 17 p refs Presented at the Atomic Theory Workshop on Relativistic and QED Effects in Heavy Atoms, Gaithersburg, Md., 23 May 1985
(Contract DE-AC03-76SF-00098)
(DE85-016633; LBL-19884; CONF-8505189-1) Avail: NTIS HC A02/MF A01

New experiments to test quantum electrodynamics (QED) in strong Coulomb fields and to study atomic collisions at ultrarelativistic energies are proposed. A 0.1% measurement of the 2(2)P/sub 1/2/-2(2)S/sub 1/2/ splitting in lithium-like uranium (Z=92) and the 2(3)P0 - 2(3)S1 splitting in helium-like uranium is proposed as a sub 1% test of the Lamb shift in a strong Coulomb field. Measurements of the hyperfine splitting of hydrogenlike thallium (Z=81) and the g/sub j/ factor of the ground state of hydrogenlike uranium are propsed as a test of the QED contribution to the magnetic moment of an electron bound in a strong Coulomb field. Measurements of capture cross sections for ultra relativistic very heavy nuclei are proposed to look for the capture of electrons from pair production. DOE

N86-15104# California Univ., Berkeley. Lawrence Berkeley Lab.
CHARACTERIZING THE SOURCES, RANGE, AND ENVIRONMENTAL INFLUENCES OF RADON 222 AND ITS DECAY PRODUCTS
A. V. Nero, R. G. Sextro, S. M. Doyle, B. A. Moed, W. W. Nazaroff, K. L. Revzan, and M. B. Schwehr Jun. 1985 16 p refs
(Contract DE-AC03-76SF-00098)
(DE85-016643; LBL-19869; EEB-Vent-85-9) Avail: NTIS HC A02/MF A01

Recent results from our group directly assist efforts to identify and control excessive concentrations of radon 222 and its decay products in residential environments. We have demonstrated directly the importance of pressure-induced flow of soil gas for transport of radon from the ground into houses. Analysis of available information from measurements of concentration in US homes has resulted in a quantitative appreciation of the distribution of indoor levels, including the degree of dependence on geographic location. Experiments on the effectiveness of air cleaning devices for removal of particles and radon decay products indicate the potential and limitations of this approach to control. DOE

N86-15105# California Univ., Berkeley. Lawrence Berkeley Lab.
CONFINEMENT AT LARGE-N
F. R. Klinkhamer Jun. 1985 23 p Presented at the Conference on Quark Confinement and Liberation: Numerical Results and Theory, Berkeley, Calif., 22 May 1985
(Contract DE-AC03-76SF-00098)
(DE85-016645; LBL-19746; CONF-8505188-1) Avail: NTIS HC A02/MF A01

Recent numerical results indicate that QCD in the limit of an infinite number (N) of colors also has confinement and moreover that it looks rather similar to normal QCD with N = 3 colors. This imposes severe restrictions on what the mechanism of confinement can be. DOE

N86-15106# Oak Ridge Y-12 Plant, Tenn.
NUCLEAR MAGNETIC RESONANCE (NMR) ANALYSIS OF A KEL-F RESIN AND LACQUER
A. C. Rutenberg 2 Aug. 1985 24 p refs
(Contract DE-AC05-84OS-21400)
(DE85-016979; Y/DK-416) Avail: NTIS HC A02/MF A01

Proton, carbon, and fluorine nuclear magnetic resonance (NMR) spectroscopy has been used at the Oak Ridge Y-12 Plant to determine the concentration of various species present in Kel-F 800 resin and its lacquers. Nuclear magnetic resonance (NMR) spectroscopy has been used to characterize Kel-F 800 resin and to measure the various chemical species present in a lacquer based on this resin. Proton NMR spectroscopy was used to measure the ratio of ethyl acetate to xylenes and to estimate the vinylidene fluoride content of the resin. Fluorine NMR spectroscopy was used to determine the water and ethanol content of the lacquer as well as some of its components. Fluorine NMR spectroscopy was also used to estimate the amount of perfluorodecanoate emulsifier present in the Kel-F resin. Carbon-13 NMR spectroscopy was used to determine the isomeric composition of various batches of xylenes and as an alternate method for measuring the vinylidene fluoride content of the resin. DOE

N86-15107# California Univ., Berkeley. Lawrence Berkeley Lab.
HEAVY ION FUSION HALF YEAR REPORT, OCTOBER 1, 1984-MARCH 30, 1985
Jun. 1985 26 p
(Contract DE-AC03-76SF-00098)
(DE85-017257; LBL-19501) Avail: NTIS HC A03/MF A01

Summaries of research are given for each of the following experiments: (1) MBE-4: a four-beam induction linac experiment, (2) performance of the MBE-4 injector, (3) design procedure for acceleration and bunching in an induction linac, (4) longitudinal dynamics of MBE-4, (5) transverse beam dynamics, (6) envelope functions of high-current beam, (7) electrostatic energy analyzer,

(8) longitudinal beam control, (9) a capacitive beam-charge monitor for SBTE, (10) materials R and D, (11) simulations of Robertson's lens, and (12) SBTE high sigma0 high-current stability limits. DOE

N86-15108# California Univ., Berkeley. Lawrence Berkeley Lab.
HAMILTONIAN SYSTEMS IN ACCELERATOR PHYSICS
L. J. Laslett Jun. 1985 15 p Presented at the Orbital Dynamics and Aplications to Accelerators Workshop, Berkeley, Calif., 7 Mar. 1985
(Contract DE-AC03-76SF-00098)
(DE85-016565; LBL-19797; CONF-8503105-8) Avail: NTIS HC A02/MF A01

General features of the design of annular particle accelerators or storage rings are outlined and the Hamiltonian character of individual-ion motion in one spatial degree of freedom, of an ion subject to a periodic nonlinear focusing force. A canonical transformation describing coupled nonlinear motion is also given, and alternative types of graphical display are suggested for the investigation of long-term stability in such cases. DOE

N86-15109# Stanford Linear Accelerator Center, Calif.
STATUS OF NETWORKING FOR HIGH ENERGY PHYSICS IN THE UNITED STATES
P. F. Kunz Jun. 1985 8 p Presented at the Conference on Computing in High Energy Physics, Amsterdam, the Netherlands, 25 Jun. 1985
(Contract DE-AC03-76SF-00515)
(DE85-016503; SU-SLAC-PUB-3705; CONF-8506157-4) Avail: NTIS HC A02/MF A01

Networks are used extensively for High Energy Physics in the United States. Although the networks have grown in an ad hoc manner with connections typically being made to satisfy the needs of one detector group, they now encompass to large fraction of the US HEP community in one form or another. This paper summarizes the current status and experience with networks. DOE

N86-15110# Fermi National Accelerator Lab., Batavia, Ill.
FERMILAB ADVANCED COMPUTER PROGRAM MULTI-MICROPROCESSOR PROJECT
T. Nash, H. Areti, J. Biel, G. Case, A. Cook, M. Fischler, I. Gaines, R. Hance, D. Husby, and T. Zmuda Jun. 1985 11 p Presented at the Conference on Computing in High Energy Physics, Amsterdam, the Netherlands, 25 Jun. 1985
(Contract DE-AC02-76CH-03000)
(DE85-015817; FNAL/C-85/94; CONF-8506157-3) Avail: NTIS HC A02/MF A01

Fermilab's Advanced Computer Program is constructing a powerful 128 node multi-microprocessor system for data analysis in high-energy physics. The system will use commercial 32-bit microprocessors programmed in FORTRAN-77. Extensive software supports easy migration of user applications from a uniprocessor environment to the multiprocessor and provides sophisticated program development, debugging, and error handling and recovery tools. This system is designed to be readily copied, providing computing cost effectiveness of below $2200 per VAX 11/780 equivalent. The low cost, commercial availability, compatibility with off-line analysis programs, and high data bandwidths (up to 160 MByte/sec) make the system an ideal choice for applications to on-line triggers as well as an offline data processor. DOE

N86-15111# Lawrence Livermore National Lab., Calif.
FISSION CHANNEL ANALYSIS FOR (232)Th(n,F)
J. A. Becker and R. W. Bauer May 1985 6 p refs Presented at the International Congress on Nuclear Data for Basic and Applied Science, Santa Fe, N. Mex., 13 May 1985
(Contract W-7405-eng-48)
(DE85-012915; UCRL-91769; CONF-850507-31) Avail: NTIS HC A02/MF A01

Angular distributions of fission fragments produced in the (232)Th (n,f) reaction have been measured in 40-keV intervals. A simplified reaction model is adopted, and a channel analysis done for 0.72 less than or equal to E/sub n/ (MeV) less than or equal to 4.5. An anomaly at E/sub n/ = 2.98 MeV suggests that K remains a good quantum number some 2 MeV above fission threshold. The percentage contribution to the cross section of K = 3/2 states for incident neutron energies between 1.1 and 1.3 MeV is larger than previously thought. DOE

74 OPTICS

Includes light phenomena.

N86-15112 Alabama Univ., Birmingham.
CAUSTIC WAVE ABERRATION THEORY FOR GENERAL OPTICAL SYSTEMS Ph.D. Thesis
Abd Mohamad Kassim 1985 290 p
Avail: Univ. Microfilms Order No. DA8513345

A new technique for evaluating wave aberrations has been introduced. This technique is based upon the caustic surfaces of an optical system. The caustic wave aberration function has been evaluated for optical systems and shows very good agreement with the conventional wave aberration function. A caustic merit function, which measures the spread of the caustic surfaces from an ideal image point, has been introduced to minimize the aberrations of an optical system. Evaluation of this function requires a few rays to be traced through the optical system. For the singlet and doublet lenses, the caustic merit function has been compared to the RMS blur circle radius and the third order aberration theory as a function of the system variables and the field of view. For the triplet lens, the caustic merit function has been used to optimize several lenses. The resulting systems have been evaluated for several fields of view by comparing the RMS blur circle radius, transverse and wave aberration functions to the results obtained by conventional design of a similar triplet. Author

N86-15113*# Babcock and Wilcox Co., Alliance, Ohio. Research and Development Div.
DEVELOPMENT OF OPTICAL DIAPHRAGM DEFLECTION SENSORS Final Report
W. L. Ghering, D. Varshneya, L. A. Jeffers, R. T. Bailey, and J. W. Berthold Jun. 1985 49 p
(Contract NAS3-23712)
(NASA-CR-175008; NAS 1.26:175008; RDD:85:4101-12-01:01) Avail: NTIS HC A03/MF A01 CSCL 20F

The objective of this project was to develop high-temperature pressure sensors using non-metallic components and optical sensing methods. The sensors are to operate over a temperature range from room temperature approx. 20C to 540C, to respond to internal pressure up to 690 kPa, to respond to external pressure up to 690 kPa, and to withstand external overpressure of 2070 kPa. Project tasks include evaluating sensing techniques and sensor systems. These efforts include materials and sensing method selection, sensor design, sensor fabrication, and sensor testing. Sensors are tested as a function of temperature, pressure, overpressure, and vibration. The project results show that high-temperature pressure sensors based on glass components and optical sensing methods are feasible. The microbend optical diaphragm deflection sensor exhibits the required sensitivity and stability for use as a pressure sensor with temperature compensation. for the microbend sensor, the 95% confidence level deviation of input pressure from the pressure calculated from the overall temperature-compensated calibration equation is 3.7% of full scale. The limitations of the sensors evaluated are primarily due to the restricted temperature range of suitable commercially available optical fibers and the problems associated with glass-to-metal pressure sealing over the entire testing temperature range. Author

N86-15114# Aerospace Corp., El Segundo, Calif. Electronics and Optics Div.
LINE OF SIGHT OF AN ABERRATED OPTICAL SYSTEM Final Report
V. N. Mahajan 14 Jan. 1985 46 p
(Contract F04701-83-C-0084)
(AD-A157683; TR-0084A(5431)-1; SD-TR-85-34) Avail: NTIS

HC A03/MF A01 CSCL 20/6

The line of a sight (LOS) of an aberrated optical system is defined in terms of the centroid of its point spread function (PSF) and also in terms of its optical transfer function as well as its pupil function. Although the PSFs obtained according to wave diffraction optics and ray geometrical optics are quite different, they have the same centroid. For an aberration-free pupil, different amplitude distributions across it give the same centroid location; for an aberrated pupil, not only the phase but also the amplitude distribution affects the centroid location. It the amplitude across a pupil is uniform, the centroid may be obtained from the aberration along its perimeter only, without regard for the aberration across its interior regardless of shape. Next, an optical system with aberrated but uniformly illuminated annular pupil is considered. The aberration function is expanded in terms of Zernike annular polynomials. It is shown that only those aberrations that vary with angle as cos theta or sin theta contribute to the LOS. A simple expression is obtained for the LOS in terms of the Zernike aberration coefficients. Similar results are obtained for annular pupils with radially symmetric illumination. Specific results are discussed for annular pupils aberrated by classical primary and secondary coma. As an example of a radially symmetric illumination, we obtain numerical results for Gaussian illumination of aberrated annular pupils. It is emphasized that the centroid and the peak of the PSFs aberrated by coma are not coincident, and, as the amount of the aberration increases, separation of the centroid and peak locations also increases. GRA

N86-15115# RAND Corp., Santa Monica, Calif.
MEETING FUTURE C3I (COMMAND-CONTROL-COMMUNICATIONS-INTELLIGENCE) NEEDS WITH FIBER OPTICS
K. M. Poehlmann May 1985 63 p
(AD-A158338; RAND/P-7093-RGI) Avail: NTIS HC A04/MF A01 CSCL 17/2

This paper is organized so that the reader familiar with the basic principles of fiber optics presented in Section 2 may proceed directly to Section 3 where general military applications are discussed. The advantages and disadvantages of fiber optics usage, including communications security and reliability appear in this section. Each of the services has unique C3I requirements and Section 4 addresses each service's needs in separate subsections. Section 5 examines future C3I trends and research areas. A bibliography of current defense publications and technical literature follows. Readers will undoubtedly find the glossary of terms used in fiber optics development helpful. GRA

N86-15116# SRI International Corp., Menlo Park, Calif.
FOUR-WAVELENGTH LIDAR EVALUATION OF PARTICLE CHARACTERISTICS AND AEROSOL DENSITIES Final Report, 27 Sep. 1982 - 30 Apr. 1985
E. E. Uthe, J. M. Livingston, S. A. DeLateur, and N. B. Nielsen Jun. 1985 93 p
(Contract DAAG29-82-K-0191)
(AD-A158500; ARO-19987.6-GS) Avail: NTIS HC A05/MF A01 CSCL 20/5

The SRI International four-wavelength (0.53, 1.06, 3.8, 10.6 micron) lidar systems was used during the SNOW-ONE-B and Smoke Week XI/SNOW-TWO field experiments to validate its capabilities in assessing obscurant optical and physical properties. The lidar viewed along a horizontal path terminated by a passive reflector. Data examples were analyzed in terms of time-dependent transmission, wavelength dependence of optical depth, and range-resolved extinction coefficients. Three methods were used to derive extinction data from the lidar signatures. These were target method, Klett method and experimental data method. The results of the field and analysis programs are reported in the journal and conference papers that are appended to this report, and include: comparison study of lidar extinction methods, submitted to applied optics, error analysis of lidar solution techniques for range-resolved extinction coefficients based on observational data, smoke/obscurants symposium 9, Four--Wavelength Lidar Measurements from smoke week 6/SNOW-TWO, smoke/obscurants symposium 8, SNOW-ONE-B multiple-wavelength lidar measurements. Snow symposium 3, and lidar applications for obscurant evaluations, smoke/obscurants Symposium 7. The report also provides a summary of background work leading to this project, and of project results. GRA

N86-15117# Westinghouse Research and Development Center, Pittsburgh, Pa.
PROGRAM TO DEVELOP AN OPTICAL TRANSISTOR AND SWITCH Research Progress Report, 1 Sep. 1984 - 30 Mar. 1985
M. Garbuny, T. Henningsen, and R. H. Hopkins 15 Mar. 1985 39 p
(Contract F49620-84-C-0103)
(AD-A158533; Rept-85-9F42-NUTRN-R1; AFOSR-85-0487TR) Avail: NTIS HC A03/MF A01 CSCL 20/6

Previous work has proposed and analyzed the concept of two light beams interacting with a suitable medium to the effect that one beam turns the second beam on or off (an optical switch), or that the modulation in the first beam is amplified in the second (an optical transistor). Switching action was also demonstrated experimentally in uranyl for switching rates up to several kHz. In the present work, a more general survey and analysis was undertaken to identify classes and species of materials for which a particularly effective switching or transistor action can be predicted theoretically. As a class, dense materials, including liquid dyes, have broad absorption band spectra, resulting in low-performance capabilities such as a low transistor gain. In contrast, media in which atomic transitions are free, or shielded, from the fields of other atoms have, as switches and transistors, relatively high speeds of response and low demands on radiation power and mass of interacting materials. As special examples of this class, the performance characteristics of lithium and sodium were calculated and the implications of the results discussed with respect to further action. GRA

N86-15118# Naval Postgraduate School, Monterey, Calif.
OPTICAL PHASE CONJUGATION VIA STIMULATED BRILLOUIN SCATTERING IN CARBON DISULFIDE M.S. Thesis
K. P. Morton Jun. 1985 40 p
(AD-A159490) Avail: NTIS HC A03/MF A01 CSCL 20/6

The interaction of a strong, monochromatic beam of light with liquid Carbon Disulfide can produce a backscattered wave that is a phase conjugate replica of the input beam. A Neodymium-glass laser focused into an unguided cell returned 33% of the incident energy in the backscattered wave. Normal reflection from the glass surfaces of the lens and cell can account for only 2.5% of this energy. Observations were also made concerning the distortion repairing qualities of the phase conjugate wave and the sensitivity of the process to multimode excitation. Finally, appreciable visible fluorescence was observed when phase conjugation occurred. Author (GRA)

N86-15119# Sandia National Labs., Albuquerque, N. Mex.
OPTOELECTRONIC DATA LINK DESIGNED FOR APPLICATIONS IN A RADIATION ENVIRONMENT
J. J. Wiczer and C. E. Barnes 1985 9 p refs Presented at the 22nd Annual Conference on Nuclear and Space Radiation Effects, Monterey, California, 22 Jul. 1985
(Contract DE-AC04-76DP-00789)
(DE85-017117; SAND-85-0691C; CONF-850711-13) Avail: NTIS HC A02/MF A01

We report here on component and systems studies of a 10 m long, optoelectronic data transmission link designed for operation in a radiation environment. Our results show good immunity to neutron fluence levels of approximately 2 x 10 to the 14th power neutrons/sq cm. and gamma radiation levels of 10 to the 7th power rad (Si). These results suggest that radiation hardened optoelectronic data links can be designed to operate in severe environments by carefully selecting components from the existing optoelectronics technology base. DOE

N86-15120# Edgerton, Germeshausen and Grier, Inc., Goleta, Calif.
EFFICIENT OPTICAL ANALOG SIGNAL AMPLIFICATION BY BACKWARD RAMAN SCATTERING
C. H. Lin and M. A. Nelson 1985 7 p
(Contract DE-AC08-83NV-10282)
(DE85-017163; EGG-10282-2074) Avail: NTIS HC A02/MF A01

Analog signals have been amplified by backward Raman scattering in a multimode graded-index fiber. A gain of 28.5 dB and excellent time profile fidelity have been achieved. DOE

N86-15121# Edgerton, Germeshausen and Grier, Inc., Albuquerque, N. Mex.
LIGHTNING SIMULATION AND DESIGN PROGRAM (LSDP)
David A. Smith 1985 22 p Presented at the 25th Annual Meeting of the Institute of Nuclear Materials Management, Albuquerque, N. Mex., 21 Jul. 1985
(Contract DE-AC04-76DP-00789)
(DE85-016581; SAND-85-1131C; CONF-850765-31) Avail: NTIS HC A02/MF A01

This computer program simulates a user-defined lighting configuration. It has been developed as a tool to aid in the design of exterior lighting systems. Although this program is used primarily for perimeter security lighting design, it has potential use for any application where the light can be approximated by a point source. A data base of luminaire photometric information is maintained for use with this program. The user defines the surface area to be illuminated with a rectangular grid and specifies luminaire positions. Illumination values are calculated for regularly spaced points in that area and isolux contour plots are generated. The numerical and graphical output for a particular site mode are then available for analysis. The amount of time spent on point-to-point illumination computation with this progress is much less than that required for tedious hand calculations. The ease with which various parameters can be interactively modified with the progress also reduces the time and labor expended. Consequently, the feasibility of design ideas can be examined, modified, and retested more thoroughly, and overall design costs can be substantially lessened by using this progress as an adjunct to the design process. DOE

N86-14846# Joint Publications Research Service, Arlington, Va.
TECHNICAL VISION FOR ROBOTS
In its USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-85-004) 29 Jan. 1985 p 68 Transl. into ENGLISH from Tass (Dushanbe, USSR), 17 Nov. 1984 (For primary document see N86-14845 05-51)
Avail: NTIS HC A06

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.

For ionospheric plasmas see *46 Geophysics.* For space plasmas see *90 Astrophysics.*

N86-15122*# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Mechanical Engineering.
FUNDAMENTAL STUDIES ON A HEAT DRIVEN LAMP Final Report, 1 Sep. 1983 - 1 Sep. 1984
John L. Lawless [1985] 40 p refs
(Grant NAG3-437)
(NASA-CR-176381; NAS 1.26:176381) Avail: NTIS HC A03/MF A01 CSCL 20I

A detailed theoretical study of a heat-driven lamp has been performed. This lamp uses a plasma produced in a thermionic diode. The light is produced by the resonance transition of cesium. An important result of this study is that up to 30% of the input heat is predicted to be converted to light in this device. This is a major improvement over ordinary thermionic energy converters in which only approx. 1% is converted to resonance radiation. Efficiencies and optimum inter-electrode spacings have been found as a function of cathode temperature and the radiative escape factor. The theory developed explains the operating limits of the device. Author

N86-15123# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
LABORATORY OBSERVATIONS OF ION-CYCLOTRON WAVES ASSOCIATED WITH A DOUBLE LAYER IN AN INHOMOGENEOUS MAGNETIC FIELD Progress Report
M. J. Alport, S. L. Cartier, and R. L. Merlino Jan. 1985 38 p
(Contract N00014-83-K-0452)
(AD-A156624; UI-85-4) Avail: NTIS HC A03/MF A01 CSCL 20/9

Observations of coherent electrostatic ion-cyclotron (EIC) waves associated with a strong, magnetized double layer are presented. The double layers are produced by applying a positive potential to an electrode located in a diverging, solenoidal magnetic field region of a weakly ionized argon plasma. Ionization within the electrode sheath is essential to the formation of these double layers. The resulting V-shaped potential structures have extended parallel, oblique and perpendicular electric field components. The frequency of the ion-cyclotron instability is dependent upon the position of the magnetic field-aligned potential structure. The propagation properties of the EIC waves are presented, and a discussion is given of the possible excitation mechanisms. GRA

N86-15124# United Technologies Research Center, East Hartford, Conn.
THEORETICAL STUDIES OF KINETIC MECHANISMS OF NEGATIVE ION FORMATION IN PLASMAS Final Report, 1 Jun. 1983 - 1 Jun. 1985
H. H. Michels and R. H. Hobbs Jun. 1985 34 p
(Contract F49620-83-C-0094)
(AD-A159044; UTRC/R85-926533; AFOSR-85-0737TR) Avail: NTIS HC A03/MF A01 CSCL 20/9

This technical program constitutes a theoretical research investigation of the kinetic mechanisms of negative ion formation in plasmas. This study was directed toward elucidating the mechanisms of the most important volume-dependent reactions that occur in hydrogen-ion H(-) (D(-)) source devices, primarily of the Belchenko-Dimov-Dudnikov (BDD) type and toward evaluating other light negative anions, such as (Li(-)), as possible sources. The primary goal of this research was to identify the most important reactions leading to negative ion production or destruction and to estimate these reaction rates as a function of system parameters such as density, composition and temperature. A further goal was to explore new chemical sources for the production of light mass negative atomic ions. Results of this program furnish data and provide direction for more detailed investigations into the kinetics of both gas phase and gas-surface reaction rates of importance in ion source devices and provide input for reliable modeling of such systems. This investigation was carried out using quantum mechanical methods. Both ab initio and density functional approaches were employed. GRA

N86-15125# TRW Systems and Energy, Redondo Beach, Calif. Energy Div.
COAL-FIRED MHD COMBUSTOR DEVELOPMENT PROJECT: PHASE 3D Quarterly Technical Progress Report, 1 Feb. - 30 Apr. 1985
20 May 1985 39 p
(Contract DE-AC22-84PC-70508)
(DE85-014459; MHD-III-85-037; QTPR-4) Avail: NTIS HC A03/MF A01

This fourth quarterly technical progress report of the Coal-Fired MHD Combustor Development Project (Phase 3D) presents the accomplishments during the period February 1 to April 30, 1985. The scope of work covered by this quarterly report encompasses development work on the 50 MW/sub t/ combustor related to test support at the CDIF, assembly and checkout of first and second stage hardware, second stage design verification testing, designs for a continuous slag rejector and low preheat inlet section, and planning for power train testing. Progress includes the following: assembly and checkout of the second first stage, two second

stages, and PEM was completed and the hardware was shipped to CDIF and FETS; integration of first and second stage hardware on the FETS Cell No. 2 test stand was completed, cold flow functional tests were performed, and hot fire checkout testing was initiated; assembly of the continuous slag rejector test set-up was 70% completed; the low preheat air inlet section Preliminary Design Review was held (work on the detail design was initiated and is 85% complete); and the Users' Manual was updated to include material for the second stage and final revisions to the power train test plan were made. DOE

N86-15126# Lawrence Livermore National Lab., Calif.
ELIMINATION OF ELECTROMAGNETIC RADIATION IN PLASMA SIMULATION: THE DARWIN OR MAGNETOINDUCTIVE APPROXIMATION
D. W. Hewett 21 Feb. 1985 16 p refs Presented at the 2nd Intern. School for Space Simulation, Honolulu, 3 Feb. 1985
(Contract W-7405-eng-48)
(DE85-016074; UCRL-91640; CONF-850266-7) Avail: NTIS HC A02/MF A01

For many astrophysical and most magnetic fusion applications, the purely electromagnetic modes generated by real as well as simulation plasma fluctuations are a source of high frequency radiation that is often irrelevant to the physics of interest. Unfortunately, a numerical CFL stability limit prevents either making c infinite or deltat large while using the usual explicit Maxwell's equations for the fields. A modification of Maxwell's equations, which provides implicitly the field components, circumvents this problem. The solution is to neglect retardation effects so that the electromagnetic propagation speed is effectively infinite. The purely electromagnetic modes in this limit evolve instantly to a time-asymptotic configuration about the macroscopic plasma configuration at each new time level. The Darwin or magnetoinductive approximation effectively provides infinite propagation speeds for purely electromagnetic modes by converting Maxwell's equations from hyperbolic to elliptic in character. In practice, this is accomplished by neglecting the solenoidal part of the displacement current. The elimination of the CFL time step constraint more than offsets the substantially more complicated field solution that is required. The details of a numerical implementation of this model will be presented. Numerical examples will be given and extentions of the Darwin field solution to other plasma models also will be considered. DOE

N86-15127# Oak Ridge National Lab., Tenn.
MODULAR TOKAMAK REACTOR CONFIGURATION
S. L. Thomson, G. T. Bussell, and T. G. Brown 1985 14 p Presented at the TPSS Meeting, Atlanta, Georgia, 15 May 1985
(Contract DE-AC05-84OR-21400)
(DE85-016399; CONF-8505175-3) Avail: NTIS HC A02/MF A01

The viewgraphs presented at this meeting on modular tokamaks are given. Some modular tokamak features presented are reduced fusion size, simpler maintenance, compatible generic design, and modular design. Structural analysis, vacuum system, and primary heat transport system/blanket design are some other modular issues presented. DOE

N86-15128# Oak Ridge National Lab., Tenn.
HOW TO WORK WITH RHIC (REALLY HIGHLY INTERESTING COLLIDER)
G. R. Young 1985 21 p Presented at the Workshop on Experiments for RHIC, Upton, N.Y., 15 Apr. 1985
(Contract DE-AC05-84OR-21400)
(DE85-016471; CONF-8504152-5) Avail: NTIS HC A02/MF A01

Some issues pertinent to the design of collider rings for relativistic heavy ions are presented. Experiments at such facilities are felt to offer the best chance for creating in the laboratory a new phase of subatomic matter, the quark-gluon plasma. It appears possible to design a machine with sufficient luminosity, even for the heaviest nuclei in nature, to allow a thorough exploration of the production conditions and decay characteristics of quark-gluon plasma. Specific features of the proposed Relativistic Heavy-Ion Collider (RHIC) at BNL are discussed with an eye toward implications for experiment. DOE

N86-15129# Science Applications International Corp., Boulder, Colo. Plasma Research Inst.
ENTROPY PRODUCTION DETERMINATION OF THE AMBIPOLAR SOLUTION NEAREST EQUILIBRIUM, REVISION
P. J. Catto and J. R. Myra May 1985 27 p
(Contract DE-AC03-76ET-53057)
(DE85-016213; SAIC-84/1787/PRI-84-Rev) Avail: NTIS HC A03/MF A01

A general derivation of the steady state entropy production equation is presented for a confined plasma which loses particles and energy via radial transport and, perhaps, end loss. The resulting equation is employed to determine which root or solution at each pressure surface is closest to local thermodynamic equilibrium when more than one self-consistent or ambipolar solution is possible. The solution closest to local thermodynamic equilibrium is presumed to be the one with the smallest total collisional entropy production rate. This solution makes the distribution functions as close to local Maxwellians as possible. DOE

N86-15130# California Univ., Berkeley. Lawrence Berkeley Lab.
HIGH CURRENT BEAM TRANSPORT WITH MULTIPLE BEAM ARRAYS
C. H. Kim May 1985 18 p Presented at the Workshop on High Brightness, High Current, High Duty Factor Ion Injectors, San Diego, Calif., 21 May 1985
(Contract DE-AC03-76SF-00098)
(DE85-016557; LBL-19809; CONF-8505164-7) Avail: NTIS HC A02/MF A01

Highlights of recent experimental and theoretical research progress on the high current beam transport of single and multiple beams by the Heavy Ion Fusion Accelerator Research (HIFAR) group at the Lawrence Berkeley Laboratory (LBL) are presented. In the single beam transport experiment (SBTE), stability boundaries and the emittance growth of a space charge dominated beam in a long quadrupole transport channel were measured and compared with theory and computer simulations. Also, a multiple beam ion induction linac (MBE-4) is being constructed at LBL which will permit study of multiple beam transport arrays, and acceleration and bunch length compression of individually focused beamlets. Various design considerations of MBE-4 regarding scaling laws, nonlinear effects, misalignments, and transverse and longitudinal space charge effects are summarized. Some aspects of longitudinal beam dynamics including schemes to generate the accelerating voltage waveforms and to amplify beam current are also discussed. DOE

N86-15131# Los Alamos National Lab., N. Mex.
DETERMINATION OF CTX EQUILIBRIA
S. O. Knox, C. W. Barnes, G. J. Marklin, T. R. Jarboe, I. Henins, H. W. Hoida, and B. I. Wright 1985 6 p Presented at the 7th US Symposium on Compact Toroid Research, Santa Fe, N. Mex., 21 May 1985
(Contract W-7405-eng-36)
(DE85-012739; LA-74-85-1792; CONF-8505100-7) Avail: NTIS HC A02/MF A01

The method by which we determine the magnetic field equilibrium for CTX in a nonperturbing manner is presented. Measurements of flux conserver image currents are combined with calculations from a numerical model of the equilibrium. Results give equilibria which differ significantly from the minimum energy state, but the equilibria data are well-described by a model where j/B has a linear dependence on the poloidal flux function. The observation of nondisruptive rotating internal kink distortions (with toroidal mode numbers n = 1, 2 and 3) within the equilibria and theoretical MHD thresholds for the onset of these modes corroborate the inferred equilibria. DOE

N86-15132# Sandia National Labs., Albuquerque, N. Mex.
DESIGN CONCEPTS FOR PBFA-2'S APPLIED-B ION DIODE
D. C. Rovang 1985 13 p Presented at the 5th IEEE Pulsed

Power Conference, Washington, D.C., 10 Jun. 1985
(Contract DE-AC04-76DP-00789)
(DE85-013145; SAND-84-2549C; CONF-850616-34) Avail: NTIS HC A02/MF A01

The lithium ion diode to be used at the center of Particle Beam Fusion Accelerator-II (PBFA-II) at Sandia National Laboratories is an applied-B ion diode. The center section of the PBFA-II accelerator is where the electrical requirements of the accelerator, the design requirements of the diode, and the operational requirements must all be satisfied simultaneously for a successful experiment. From an operational standpoint, the ion diode is the experimental hub of the accelerator and needs to be easily and quickly installed and removed. Because of the physical size and geometry of the PBFA-II center section, achieving the operational requirements has presented an interesting design challenge. A discussion of the various design requirements and the proposed concepts for satisfying then is presented. DOE

N86-15133# Illinois Univ., Urbana. Fusion Studies Lab.
ALPHA-DRIVEN FAST MAGNETOSONIC WAVE HEATING IN TOKAMAK PLASMAS
G. H. Miley, W. R. Sutton, III, and D. J. Sigmar 1985 5 p Presented at the 12th European Conference on Controlled Fusion and Plasma Physics, Budapest, 2 Sep. 1985 Prepared in cooperation with Southern Company Services, Inc., Birmingham, Ala. and ORNL, Tenn.
(Contract DE-AC02-76ET-52040)
(DE85-014279; CONF-850927-3; COO-2218-318) Avail: NTIS HC A02/MF A01

An alpha-driven fast magnetosonic wave instability is investigated in tokamak plasmas for propagation transverse to the external magnetic field at frequencies several times the alpha gyrorate. A two-dimensional differential quasi-linear diffusion equation is derived in cylindrical v/sub perpendicular/ -v/sub parallel/ geometry. The quasi-linear diffusion coefficients in the small parameter k/sub parallel/k/sub perpendicular/ are expanded and the problem is reduced to one dimension by integrating out the v/sub parallel/ dependence. Reactor relevant information is obtained using data from the one-dimensional formulation in a 1-1/2 dimensional tokamak transport code. Contour plots of the alpha threshold fraction are used to identify the instability regions in the n/sub e/-T/sub i// plane. Alpha/background electron fractions as low as 10 to the -6 power to 10 to the -4 power may trigger the instability. for a typical reactor-size tokamak, an enhancement of the fraction of the alpha energy transferred to ions by as much as 1.5 can occur for T/sub i/ = T/sub e/ at 7 keV. Still, due to the rapid equilibration of electron and ion temperatures, a < 1 to 2% increase in fusion power occurs overall. DOE

N86-15134# FOM-Inst. voor Plasmafysica, Rijnhuizen, Jutphaas (Netherlands).
ANOMALOUS PLASMA HEATING INDUCED BY MODULATION OF THE CURRENT-DENSITY PROFILE
N. J. Lopes Cardozo May 1985 115 p refs Sponsored by Euratom and Netherlandse Organisatie voor Zuiver-Wetenschappelijk Onderzoek
(Rept-85-160) Avail: NTIS HC A06/MF A01

A second rise in plasma temperature after a rise and fall caused by a 10 microsec high voltage pulse applied to a tokamak discharge was investigated. The second heating effect is slow, the temperature peaking 2 msec after pulse application. The delay is puzzling since the energy confinement time of the plasma is only 1.7 msec. Analysis of X-ray measurements suggests that magnetic energy is converted into heat. Extra current induced on top of the running plasma current spreads over the entire plasma, due to turbulent processes. Simultaneously, magnetic field lines are broken, permitting radial particle transport. After the current pulse is extracted, a sharpened j-profile is established. The net energy input due to the pulse is stored as 1/2 delta Llsq rho, where delta L is the increase of the self-inductance of the plasma corresponding to the narrowing of the j-profile. Author (ESA)

N86-15135# FDO Technische Adviseurs B.V. (Netherlands).
CHANNEL DESIGN FOR CLOSED CYCLE MHD
G. K. Troost, C. A. L. Kemper, T. W. Verbruggen, R. F. vanderWijngaart (NLR, Amsterdam), and J. P. F. Lindhout (NLR, Amsterdam) 1985 18 p refs
(FDO-TPV-84-014; B8566682) Avail: NTIS HC A02/MF A01

System design studies for medium scale power plants with a closed cycle MHD topping were performed. The studies show a potential for early commercialization of the direct energy conversion technology for coal and natural gas fired utility installations. As a first step towards the large scale application of MHD, this technology can demonstrate an economically high enthalpy extraction on an intermediate scale. The closed cycle MHD power train, and in particular the generator, was studied, and a basic design configuration was defined. Author (ESA)

N86-15136# Rome Univ. (Italy). Dipt. di Fisica.
THE REPRESENTATION OF THE SUBNUCLEAR WORLD IN THE MODERN MAN'S MIND [LA RAPPRESENTAZIONE DEL MUNDO SUBNUCLEARE NELLA MENTE DELL'UOMO CONTEMPORANEO]
Giordano Diambrini Palazzi 8 May 1985 21 p In ITALIAN Presented at Conv. Che cosa e il pensiero. L'unita dell'essere, Lincei, Italy, 9-11 May 1984
(Nota-Interna-849) Avail: NTIS HC A02/MF A01

The history of subnuclear particle research is reviewed. Quarks, leptons, and bosons are discussed. The experiments UA1 end UAZ performed at the CERC proton synchroton are discussed. A chart showing experimental dimensional order of magnitude down to Plank's length is included. Author (ESA)

N86-14413# Osaka Univ. (Japan). Course of Electromagnetic Energy Engineering.
PULSED POWER COMPRESSION BY PLASMA OPENING SWITCH
Noboru Yugami, Shuji Miyamoto, Hirokazu Fujita, Tetsu Ozaki, Tatsuro Akiba, Kazuo Imasaki, Sadao Nakai, and Chiyoe Yamanaka *In its* Technology Reports of the Osaka University, Vol. 35, Nos. 1800-1818 Oct. 1985 p 255-260 refs (For primary document see N86-14405 05-31)
Avail: NTIS HC A09/MF A01

N86-14429# Yamaguchi Univ., Ube (Japan).
WALL EFFECTS ON THE PRODUCTION PROCESSES OF POSITIVE AND NEGATIVE IONS IN HYDROGEN PLASMAS
Seiji Isokane, Mitsugu Ueda, Osamu Fukumasa, and Setsuo Saeki *In its* Memoirs of the Faculty of Engineering, Yamaguchi University, Vol. 36, No. 1 Oct. 1985 p 105-115 refs In JAPANESE; ENGLISH summary (For primary document see N86-14418 05-31)
Avail: NTIS HC A09/MF A01

N86-14439# Joint Publications Research Service, Arlington, Va.
CHINA'S FIRST CONTROLLED THERMONUCLEAR FUSION EXPERIMENT DETAILED
Zhiyao Zhu and Youquan Hu *In its* China Report: Science and Technology (JPRS-CST-85-033) 30 Sep. 1985 p 66-70 Transl. into ENGLISH from Kexue Shiyan (Beijing), no. 2, 10 Feb. 1985 p 2-4 (For primary document see N86-14438 05-31)
Avail: NTIS HC A06/MF A01

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N86-15137*# Cornell Univ., Ithaca, N.Y. Dept. of Materials Science and Engineering.
ULTRAPRESSURE MATERIALS SCIENCE Final Report, 1 Jan. 1982 - 30 Jun. 1984
Arthur L. Ruoff 30 Jun. 1984 16 p refs
(Grant NAG2-158)

(NASA-CR-176397; NAS 1.26:176397) Avail: NTIS HC A02/MF A01 CSCL 20L

Three active areas of research at ultra pressure are pursued, i.e., diffraction studies with the Cornell High Energy Synchrotron Source (CHESS), band gap and absorption edge effects, indentor-anvil experiments and theory and research to attain higher pressures. The range over which X-ray diffraction data and absorption edge data are obtained is extended to 700 kbars. Using the indentor technique pressures of 2.1 Mbars are obtained. Research results and methods are discussed. Author

N86-15138# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.

STUDIES ON AMORPHIZING SILICON USING SILICON ION IMPLANTATION Interim Report, Jul. 1983 - Jul. 1984

N. C. Fernelius, T. L. Peterson, M. C. Ohmer, D. C. Ingram, and A. W. McCormick Apr. 1985 54 p

(AF Proj. 2306)

(AD-A157684; AFWAL-TR-84-4115) Avail: NTIS HC A04/MF A01 CSCL 20/12

Studies of various conditions to create amorphous Si regions suitable for recrystallization of 0.3 micron and 0.5 micron Si films were made on the Varian 400-10AR Ion Implanter in the Avionics Laboratory and on the General Ionex Corporation 1.7 MeV Tandetron accelerator at Universal Energy Systems. Experimentally, cooling the sample substrate was found to be very important to achieving amorphous regions in the sample. Toward the end of this effort, Dow Corning heat sink compound RTV 340 was found to be a superior mounting medium to rubber cement. GRA

N86-15139# Innsbruck Univ. (Austria).

HOT ELECTRON EMISSION IN SEMICONDUCTORS Interim Report, Jan. - Jun. 1985

E. Gornik, R. A. Hoepfel, and M. Helm 5 Jul. 1985 8 p

(Contract DAJA45-84-C-0052)

(AD-A157691; IR-2) Avail: NTIS HC A02/MF A01 CSCL 20/12

The hot electron temperature of 2D-electrons in GaAs/GaAlAs heterostructures depends linearly on the input power as obtained from FIR emission experiments. From saturation absorption measurements we have obtained for the first time energy relaxation times for 2D electrons in GaAs in high magnetic fields. The streaming of hot carriers in crossed electric and magnetic fields has been observed in p-Ge and n-GaAs. This is a potential concept to obtain a FIR laser. GRA

N86-15140# Oxford Superconducting Technology, Carteret, N.J.

ONE STEP INTERNAL TIN Nb3Sn SUPERCONDUCTOR FABRICATION Final Report, Jun. 1983 - Aug. 1984

W. Marancik Mar. 1985 26 p

(Contract F33615-83-C-2324)

(AD-A158444; AFWAL-TR-85-2007) Avail: NTIS HC A03/MF A01 CSCL 13/8

The object of this research is to demonstrate the feasibility of producing a Nb3Sn superconductor in a single extrusion process with a large number of filaments with internal tin. The technique chosen uses .010' diameter Nb and tin plated Cu wires formed into a solenoid. The solenoid is covered with tin plated copper foil and isostatically compacted to a pressure of 17,000 psi. The solenoid is slit along its length. This results in a ribbon about 40 inches long by about 5 inches wide, with the Nb wires running across the 5 inch width. The ribbon is then rolled up (Jelly Roll) around a 0.5 inch diameter Ta covered copper rod to produce a composite of about 1.5 inches in diameter by 5 inches long. The composite geometry is now a cylindrical bundle of 0.010 inch diameter Nb wire separated from each other by tin plated copper. Each Nb wire is aligned with the axis of cylinder. The cylinder is slid into a Ta lines copper extrusion can which is evacuated and sealed. The can is extruded at a low temperature and drawn to final wire size without intermediate annealing. The advantage of the process is that it is an internal tin process with the tin uniformly distributed through the matrix. The Nb is in a relatively soft state having been fully annealed at 0.020 inch diameter. Only one extrusion is required since the bundling technique allows a large number of wires to be precisely aligned and spaced in the matrix. GRA

N86-15141# GTE Labs., Inc., Waltham, Mass.

HIGH SPEED, LOW POWER NON-LINEAR OPTICAL SIGNAL PROCESSING IN SEMICONDUCTORS Annual Report, 26 May 1984 - 25 May 1985

M. Dagenais 24 Jun. 1985 11 p

(Contract F49620-84-C-0052)

(AD-A159054; AFOSR-85-0735TR) Avail: NTIS HC A02/MF A01 CSCL 20/12

In the first year, significant advances were made in realizing the goals of this proposal. The lowest single beam switching (<8 pj) and the fastest reported ON/OFF switching (<1 ns) bistable device with clearly resolved states was demonstrated using the nonlinearity associated with bound excitons in CdS. The role of thermal effects in transient measurements done on the nanosecond time scale near free excitons was investigated theoretically. Thermal effects on the millisecond and microsecond time scales were experimentally studied. In particular, self-pulsation of the transmitted beam and intra-cavity optical bistability due to optically induced changes in absorption and refraction were investigated. Large degenerate four-wave mixing signals were observed near free and bound excitons in CdS at cryogenic temperatures. Four-wave mixing measurements at higher temperatures are now in progress. Author (GRA)

N86-15142# Rockwell International Science Center, Thousand Oaks, Calif.

FERROELECTRIC TUNGSTEN BRONZE BULK CRYSTALS AND EPITAXIAL THIN FILMS FOR ELECTRO-OPTIC DEVICE APPLICATIONS Semiannual Technical Report, 1 Oct. 1984 - 31 Mar. 1985

J. R. Oliver, R. R. Neurgaonkar, and L. E. Cross Aug. 1985 54 p Prepared in cooperation with Pennsylvania State Univ.

(Contract N00014-82-C-2466; DARPA Order 4540)

(AD-A159279; AD-E301788; SC5340.10SA; SATR-5) Avail: NTIS HC A04/MF A01 CSCL 20/2

Several doped (Ce3+Ce4+ and Fe2+/Fe3+) and undoped SBN:60 single crystals have been grown using the Czochralski technique. Optical evaluation shows that Ce-doped crystals have minimum or no striations and are of optical quality, while Fe-doped crystals are highly striated under all growth conditions. Current results suggest that the existence of striations depends strongly on the type of dopant and its location in the structure. Ce-doped SBN:60 crystals currently exhibit excellent photorefractive properties with improved sensitivity and speed, indicating possible use for this material in device applications. The bronze composition SBN:50 is being studied for pyroelectric IR focal plane array applications. SBN:50 is slightly off congruent melting; however using the current Czochralski technique is now possible to grow good quality crystals as large as 1 cm in diameter. An extensive discussion of the thermodynamic phenomenology for tungsten bronze crystals is presented. An excellent fit to birefringence polarization data for Ba2NaNb5015 (BNN) is found for the Devonshire form of the Gibbs free-energy expansion, and good agreement is found for a number of thermodynamic constants over a broad range of tungsten bronze materials. This indicates that the hypothesis of near-constant higher order stiffness parameters is a good approximation for tetragonal bronze ferroelectrics, thereby allowing the analysis of a very wide range of other bronze compositions. Author (GRA)

N86-15143# Chelsea Coll., London (England). Dielectrics Group.

DIELECTRIC SPECTROSCOPY OF SEMICONDUCTORS Final Report, Sep. 1981 - May 1985

A. K. Jonscher, C. Pickup, and S. H. Zaidi May 1985 74 p

(Contract DAJA37-81-C-0733; DA Proj. 1T1-61102-BH-57)

(AD-A159622; R/D-4039-AN) Avail: NTIS HC A04/MF A01 CSCL 20/3

Dielectric spectroscopy of semiconductors (DSS) employs dielectric measuring techniques to study delayed electronic

transitions in and out of localized energy levels in the forbidden gap. Horizontal transitions between levels normally take place in the volume of the material and involve relatively small changes of energy. Vertical transitions between deep levels and the free bands involve energy changes of the order of half the band gap and take place mainly in interfacial space charge regions ad at semi-conductor-metal interfaces. DSS is uniquely able to resolve the spectra of these delayed transitions and measurements on semi-insulating GaAs in the frequency range .01 - 10,000 Hz and between 90 and 380 K show that none of them conforms to the expected exponential time dependence. Measurements are reported of the dielectric response in the frequency range .01 - 10,000 Hz of Schottky diodes on n-type GaAs with aluminum metallization, with the results revealing several important deviations from the classically expected response. The most important and unexpected phenomena are the appearance of low-frequency dispersion (LFD) and of negative capacitance, which are strongly influenced by even small (0.1V) negative and positive biases, respectively. Both phenomena are linked with interfacial processes involving some form of instability arising from structural transformations at the metal semiconductor interface. GRA

N86-15144# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
ELECTRICAL PROPERTIES OF NITROGEN DOPED FLOAT ZONE SILICON Interim Report, Mar. 1984 - Mar. 1985
M. A. OLeary and W. C. Mitchel Jul. 1985 37 p
(AF Proj. 2306)
(AD-A159629; AFWAL-TR-85-4048) Avail: NTIS HC A03/MF A01 CSCL 20/2

Examination of nitrogen doped float zone silicon indicates that electrical properties are similiar to commerical Czochralski material. This material deserves further consideration for use in high power device and intrinsic infrared detector applications. Temperature dependent Hall effect measurements have been made on as received and neutron transmutation doped (NTD) sample of a nitrogen doped float zone silicon crystal to determine its electrical properties. Samples were studied in both as-received state and after various high temperature anneals. Results were compared with commerical n-type Czochralski silicon and conventional neutron doped float zone silcion. Undoped, annealed samples of Si:N showed signs of inhomogeneities were not seen in lightly NTD's and annealed nitrogen doped material, indicating that even light doping will mask effects of the proposed precipitation. No evidence was detected for any electrically active level that could be directly related to the nitrogen. GRA

N86-15145# Oak Ridge National Lab., Tenn.
MICROSTRUCTURE OF HIGH DOSE OXYGEN IMPLANTED SI AND ITS DEPENDENCE ON IMPLANTATION CONDITIONS
O. W. Holland, D. Fathy, T. P. Sjoreen, J. Narayan, and K. More 1985 7 p Presented at the Society of Photo-Optical Instrumentation Engineers Symposium, Los Angeles, California, 21 Jan. 1985 Prepared in cooperation with North Carolina State Univ., Raleigh.
(Contract DE-AC05-84OR-21400)
(DE85-012888; CONF-850137-5) Avail: NTIS HC A02/MF A01

The formation of a buried dielectric in single crystals of silicon by high dose implantation of oxygen ions is investigated. The dependence of the microstructure on implantation conditions is determined. It will be shown that the microstructure can be tailored by changing the implant conditions to optimize its suitability for the silicon-on-insulator technology. Mechanisms responsible for the formation of the microstructure and the influence of implantation conditions are discussed. DOE

N86-15146# California Univ., Berkeley. Lawrence Berkeley Lab.
VIBRATIONAL FREQUENCIES OF SMALL METAL CLUSTERS. THE BERYLLIUM TETRAMER
R. Murphy and H. F. Schaefer, III May 1985 11 p refs Presented at the The Hawaii Nobel Laureate Symposium, Honolulu, Hawaii, 16 Dec. 1984
(Contract DE-AC03-76SF-00098)
(DE85-016632; LBL-19875; CONF-841276-1) Avail: NTIS HC A02/MF A01

The structure and harmonic vibrational frequencies of Be4 have been predicted using ab initio molecular electronic structure theory. A better than double zeta plus polarization (DZ+P) basis set was used in conjunction with self-consistent-field (SCF) and configuration interaction (CI) methods. The predicted frequencies (SCF followed by CI in parentheses) are a1 651 (680), t2 576 (589), and e 489 (487) cm(-1), respectively. DOE

N86-15147# Brookhaven National Lab., Upton, N. Y.
INTERNAL FRICTION DUE TO DOMAIN-WALL MOTION IN MARTENSITICALLY TRANSFORMED A15 COMPOUNDS
C. L. Snead, Jr. and D. O. Welch 1985 12 p Presented at the Conference on Internal Friction and Ultrasonic Attenuation in Solids, Urbana, Ill., 3 Jun. 1985
(Contract DE-AC02-76CH-00016)
(DE85-017510; BNL-36833; CONF-8506125-8) Avail: NTIS HC A02/MF A01

A lattice instability in A15 materials in some cases leads to a cubic-to-tetragonal martensitic transformation at low temperatures. The transformed material orients in lamellae with c axes alternately aligned along the > 100 > directions producing domain walls between the lamellae. An internal-friction delta feature below T sub m is attributed to stress-induced domain-wall motion. The magnitude of the friction increases as temperature is lowered below T sub m as (1-c/a) increases, and behaves as (1-c/a)(2) from T sub m down to the superconducting critical temperature where the increasing tetragonality is inhibited. The effect of strain in the lattice is to decrease the domain-wall internal friction, but not affect T sub m. Neutron-induced disorder and the addition of some third-elements in alloying decrease both delta and T sub m, with some elements reducing only the former. Less than 1 at. % H is seen to completely suppress both delta and T sub m. Martensitically transformed V2Zr demonstrates low-temperature internal-friction and modulus behavior consists with easy BETA/m wall motion relative to the easy m/m motion of the A15's. For the V2Zr, a peak in delta is observed, qualitatively in agreement with expected BETA/m wall motion. DOE

N86-15148# Oak Ridge National Lab., Tenn.
OPTIMIZING ESTIMATES OF LONG-RANGE ORDER PARAMETERS WITH BRAGG X-RAY SCATTERING DATA
H. L. Yakel 1985 31 p Presented at the American Crystallographic Association Meeting, Stanford, Calif., 18 Aug. 1985
(Contract DE-AC05-84OR-21400)
(DE85-016589; CONF-850877-1) Avail: NTIS HC A03/MF A01

This document comprises oversize graphs divided into: assumptions, analysis, and conclusions. The conclusions were experimentally tested on spinels MM2O4, sigma phases, and tau carbides M23C6. DOE

N86-15149# Los Alamos National Lab., N. Mex.
STRUCTURAL EXAMINATION OF IRIDIUM-BASED SINGLE-CRYSTAL PREPARATIONS
K. M. Axler and R. B. Roof 1985 5 p Presented at the 34th Denver X-Ray Conference, Denver, 1 Aug. 1985
(Contract W-7405-eng-36)
(DE85-017550; LA-74-85-2920; CONF-8508118-1) Avail: NTIS HC A02/MF A01

A high-temperature crystal growth experiment produced discrete single-crystal products of AlIr and IrSi. The preparation and examination of these phases is described within. This project is part of a materials compatibility study relating to radioisotopic heat sources. These heat sources are comprised of a PuO2 fuel pellet encapsulated in an Ir alloy containment shell. Th is introduced as an additive within the Ir to maintain ductility. Si and P are picked up inadvertently in the fuel processing. The compatibility of the heat sources with Al is of interest because of potential interactions with Al alloy hardware associated with the heat source environment. DOE

N86-15150# Pacific Northwest Lab., Richland, Wash.
OPTICAL PROPERTIES OF SOLID PARTICLE RECEIVER

MATERIALS. 1: ANGULAR SCATTERING AND EXTINCTION CHARACTERISTICS OF NORTON MASTERBEADS
J. W. Griffin, K. A. Stahl, and R. B. Pettit 1985 39 p Presented at the SPIE International Technological Symposium on Optical and Electro-Optical Engineering, San Diego, Calif., 18 Aug. 1985 Prepared in cooperation with Sandia Labs., Albuquerque, N. Mex.
(Contract DE-AC04-76DP-00789)
(DE85-015494; SAND-85-0412C-1; CONF-850887-18-1) Avail: NTIS HC A03/MF A01

As part of the Solar Thermal Technology Program, the direct absorption of sunlight by free-falling particles inside a cavity receiver is being evaluated. The objective of the ongoing optical properties measurement program is to obtain information to be used as input to radiation transfer models for prediction of receiver performance. Instrumentation and data analysis techniques have been developed to determine both the angular scattering properties and the scattering and absorption components of the extinction coefficient of candidate materials. This report summarizes the measurement procedures and presents data for an iron-doped alumina spheroid, Masterbead, manufactured by Norton Chemical Co. This material exhibits good optical absorption properties over the solar insolation spectrum and favorable thermal and mechanical properties for temperatures up to 1000 C. Scattering and extinction measurements were performed at 632.8 nm in a falling curtain geometry of one-particle nominal thickness. Data were obtained over a range of mass flow rates and particle areal densities. Photographic documentation of curtain particle density enabled calculation of mean particle scattering and absorption loss components in the absence of multiple-particle optical interactions. Prediction of optical extinction properties at other wavelengths is anticipated to be straightforward using spectral hemispherical reflectance measurements on bulk samples. Additional scattering and extinction data were obtained on transparent glass microspheres for comparison and as a verification of the measurement apparatus and procedures. DOE

N86-15151# Lawrence Livermore National Lab., Calif.
PRESSURE INDUCED CHANGES IN THE ELECTRONIC STRUCTURE OF SOLIDS
A. K. McMahan Jul. 1985 40 p refs Presented at the 10th High Pressure Conference on Research in High Pressure Science and Technology, Amsterdam, the Netherlands, 8 Jul. 1985
(Contract W-7405-eng-48)
(DE85-015395; UCRL-92923; CONF-850759-8) Avail: NTIS HC A03/MF A01

A variety of high-pressure metallization and metal-semimetal transitions, crystallographic phase transitions, and equation of state and lattice vibrational anomalies are reviewed in terms of the concepts of electronic transition and pressure-induced loss of covalency. DOE

N86-15152# Brookhaven National Lab., Upton, N. Y.
CRYSTAL SITE OCCUPANCY OF ALLOYING ELEMENTS IN POLYCRYSTALLINE Nb3Sn SUPERCONDUCTORS BY ELECTRON CHANNELING
J. Tafto, R. I. Sabatini, and M. Suenaga 1985 5 p Presented at the Joint Meeting of the Electron Microscopy Society of America and the Microbeam Analytical Society, Louisville, Ky., 5 Aug. 1985
(Contract DE-AC02-76CH-00016)
(DE85-010234; BNL-36248; CONF-850840-9) Avail: NTIS HC A02/MF A01

It was found that V and Mo occupy the Nb-site in bronze processed Nb3Sn whereas the situation is still uncertain with respect to the small amount of Zr that goes into the compound. Part of these are engaged in forming ZrO2. Previously it was found that Ti and Ta, which in contrast to V and Mo increase the upper critical magnetic field, also occupy the Nb-site. Thus there appears to be no direct relationship between site occupancy of the alloying element and increased critical magnetic field. DOE

N86-14409# Osaka Univ. (Japan). Dept. of Electronics Engineering.
TUNNELING SPECTROSCOPY OF InAs- AND CdSnAs2 -OXIDE-Pb JUNCTIONS IN STRONG MAGNETIC FIELD
Yuichi Nakashima and Chihiro Hamaguchi *In its* Technology Reports of the Osaka University, Vol. 35, Nos. 1800-1818 Oct. 1985 p 221-230 refs (For primary document see N86-14405 05-31)
Avail: NTIS HC A09/MF A01

N86-14411# Osaka Univ. (Japan). Dept. of Electrical Engineering.
PHOTOCONDUCTIVITY EFFECT IN MODULATION-DOPED Al(0.3)Ga(0.7) As-GaAs MULTIPLE-QUANTUM-WELL STRUCTURES PREPARED BY MBE
Nobutomo Isshiki, Masahiro Tonomura, Junji Shirifuji, Naokatsu Sano (Kwansei Gakuin Univ.), Hiroshi Katoh (Kwansei Gakuin Univ.), Masaaki Nakayama (Kwansei Gakuin Univ.), and Yasutaka Watanabe (Kwansei Gakuin Univ.) *In its* Technology Report of the Osaka University, Vol. 35, Nos. 1800-1818 Oct. 1985 p 237-243 refs (For primary document see N86-14405 05-31)
Avail: NTIS HC A09/MF A01

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N86-15153# Nationaal Inst. voor Kernfysica en Hoge Energiefysica, Amsterdam (Netherlands). Sectie-H.
FINITE SIZE EFFECTS AND THE MASS GAP OF THE O(N) MODEL FOR ARBITRARY VALUES OF N
E. G. Floratos (Crete Univ.) and D. Petcher Mar. 1985 21 p refs
(NIKHEF-H/85-3; B8564597) Avail: NTIS HC A02/MF A01

Using the exact S-matrix and a general formula which relates finite size effects to scattering data, a formula for finite size effects on the mass gap of the quantum 0(N) nonlinear sigma-model is derived for arbitrary N. This formula is combined with the two-loop results for the mass gap of this model in a finite volume to give infinite volume mass gap estimates. The estimates are increasingly reliable for larger N and agree with lattice calculations. Author (ESA)

N86-15154# Rome Univ. (Italy). Dipt. di Fisica.
FIFTY YEARS OF WEAK INTERACTIONS: FROM FERMI THEORY TO THE DISCOVERY OF HEAVY BOSONS Ph.D. Thesis [CINQUANTA ANNI DI INTERAZIONI DEBOLI: DALLA TEORIA DI FERMI ALLA SCOPERTA DEI ROSONI PESANTI]
M. Conversi 28 Jan. 1985 38 p refs In ITALIAN
(Nota-Interna-842) Avail: NTIS HC A03/MF A01

The history of physical research on weak interactions is reviewed. The subjects include Fermi's description of beta decay, the conceptual evolution to Fermi's universal interaction principle, the problems of parity conservation and Cabibbo angle, cosmological consequences, gauge theory, and the UAl and UAZ experiments. Author (ESA)

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

N86-15155# Rome Univ. (Italy). Dipt. di Fisica.
THE DEVELOPMENT OF SCIENTIFIC KNOWLEDGE [LO SVILUPPO DELLA CONOSCENZA SCIENTIFICA]
Giordano Diambrini Palazzi 8 May 1985 17 p refs In ITALIAN Presented at Conv. Che cosa e il pensiero. L'unita dell'essere,

Lincei, Italy, 9-11 May 1984
(Nota-Interna-848) Avail: NTIS HC A02/MF A01

The history of knowledge is reviewed, discussing the temporal evolution of cumulative knowledge, which is given in a simple exponential function. This model is confirmed by historical data. Author (ESA)

N86-15182*# Westinghouse Mfg. Systems and Technology Center, Columbia, Md. Socio-Technical Engineering.
SOCIO-TECHNICAL INTEGRATION OF THE WORKPLACE
George L. Carter *In* NASA. Johnson (Lyndon B.) Space Center R and D Productivity: New Challenges for the US Space Program 1985 p 275-288 ref (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 05K

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N86-15156*# National Aeronautics and Space Administration. Kennedy (John F.) Space Center, Cocoa Beach, Fla.
CHRONOLOGY OF KSC AND KSC RELATED EVENTS FOR 1984
Ken Nail, Jr. (New World Service, Inc.) Jun. 1985 102 p
(NASA-TM-87531; NAS 1.15:87531) Avail: NTIS HC A06/MF A01 CSCL 05A

In his third State of the Union address, President Reagan told NASA to develop a permanent manned space station in 10 years. The President also ordered the Department of Transportation to help private firms launch rockets, thus introducing the commercialization of space. There were five space shuttle and six expendable vehicle launches in 1984. Materials were selected from a number of published sources. The document records KSC events of interest to historians and other researchers. Arrangement is by month; items are by date of the published sources. Actual date of the event may be indicated in parenthesis, when the article itself does not make that information explicit. Author

N86-15157*# National Aeronautics and Space Administration. Johnson (Lyndon B.) Space Center,
R AND D PRODUCTIVITY: NEW CHALLENGES FOR THE US SPACE PROGRAM
Otis W. Baskin, ed. (Houston Univ., Clear Lake) and Leslie J. Sullivan, ed. 1985 596 p refs Conference held in Houston, Tex., 10-11 Sep. 1985; sponsored in cooperation with NASA. Johnson Space Center, Houston Univ., AIAA, and the American Productivity Center
(NASA-TM-87520; NAS 1.15:87520) Avail: NTIS HC A25/MF A01 CSCL 05A

Various topics related to research and development activities applicable to their U.S. space program are discussed. Project management, automatic control technology, human resources, management information systems, computer aided design, systems engineering, and personnel management were among the topics covered. For individual titles, see N86-15158 through N86-15203.

N86-15158*# McDonnell-Douglas Astronautics Co., Houston, Tex.
IMPLEMENTING QUALITY/PRODUCTIVITY IMPROVEMENT INITIATIVES IN AN ENGINEERING ENVIRONMENT
Roger R. Ruda *In* NASA. Johnson (Lyndon B.) Space Center R and D Productivity: New Challenges for the US Space Program 1985 p 1-9 refs (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 05A

Quality/Productivity Improvement (QPI) initiatives in the engineering environment at McDonnell Douglas-Houston include several different, distinct activities, each having its own application, yet all targeted toward one common goal - making continuous improvement a way of life. The chief executive and the next two levels of management demonstrate their commitment to QPI with hands-on involvement in several activities. Each is a member of a QPI Council which consists of six panels - Participative Management, Communications, Training, Performance/Productivity, Human Resources Management and Strategic Management. In addition, each manager conducts Workplace Visits and Bosstalks, to enhance communications with employees and to provide a forum for the identification of problems - both real and perceived. Quality Circles and Project Teams are well established within McConnel Douglas as useful and desirable employee involvement teams. The continued growth of voluntary membership in the circles program is strong evidence of the employee interest and management support that have developed within the organization. Author

N86-15159*# Air Force Systems Command, Andrews AFB, Md.
THE USAF SYSTEMS COMMAND AND R AND D PRODUCTIVITY
Vince Luchainger *In* NASA. Johnson (Lyndon B.) Space Center R and D Productivity: New Challenges for the US Space Program 1985 p 10-17 (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 05A

The United States Air Force Systems Command (AFSC) is charged with the development and acquisition of aerospace technology systems. Much of that activity is concerned with space systems development, acquisition, and operations. Heavy emphasis is being placed on productivity in organizational and process functions which will keep aerospace systems on the leading edge of technology, with plans extending capability into the future. The productivity emphasis ranges from people-oriented activities to resource and technological functions which support national aerospace objectives. The AFSC space-related missions is discussed as a special area of productivity efforts. Author

N86-15160*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
SELF-RENEWAL: A STRATEGY FOR QUALITY AND PRODUCTIVITY IMPROVEMENT c38
D. H. Hutchinson *In* NASA. Johnson (Lyndon B.) Space Center R and D Productivity: New Challenges for the US Space Program 1985 p 18-31 refs (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 14D

Productivity improvement is discussed. The concept of productivity improvement is supplemented with two additional concepts of productivity improvement: effectiveness and innovation. Case studies are provided to illustrate concepts. R.J.F.

N86-15161*# Rockwell International Corp., Pittsburgh, Pa.
THE KEY TO SUCCESSFUL MANAGEMENT OF STS OPERATIONS: AN INTEGRATED PRODUCTION PLANNING SYSTEM
William A. Johnson and Christian T. Thomasen *In* NASA. Johnson (Lyndon B.) Space Center R and D Productivity: New Challenges for the US Space Program 1985 p 33-40 (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 05A

Space Transportation System operations managers are being confronted with a unique set of challenges as a result of increasing flight rates, the demand for flight manifest/production schedule flexibility and an emphasis on continued cost reduction. These challenges have created the need for an integrated production planning system that provides managers with the capability to plan, schedule, status and account for an orderly flow of products and services across a large, multi-discipline organization. With increased visibility into the end-to-end production flow for individual and parallel missions in process, managers can assess the integrated impact of changes, identify and measure the interrelationships of resource, schedule, and technical performance requirements and prioritize productivity enhancements. Author

N86-15162*# International Business Machines Corp., Armonk, N.Y.
THE STAR SYSTEM: A PRODUCTION ENGINEERING APPROACH TO STS
Robert C. Angier, Leon D. Swartz, and Joe H. Wilson *In* NASA. Johnson (Lyndon B.) Space Center R and D Productivity: New Challenges for the US Space Program 1985 p 41-49 refs (For

primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 05A

A fundamental change to the way Space Transportation System flight preparation is done is documented. It involves (1) systematic restructuring the Space Transportation System flight preparation task, to minimize its R&D content; (2) development of the Space Transportation Automated Reconfiguration (STAR) system to structure and support the remaining work flow. STAR is an integrated software system providing automation and quality control mechanisms necessary to create a production-like process. This approach was implemented using tools and methodology developed by IBM under NASA contract, to produce payload flight data requirements. It offers increased product quality, reduced cost per flight, and greater responsiveness to change. Author

N86-15163*# Columbia Univ., New York. Teachers Coll.
MANAGEMENT BEHAVIOR, GROUP CLIMATE AND PERFORMANCE APPRAISAL AT NASA
George Manderlink, Lawrence P. Clark, William M. Bernstein, and W. Warner Burke *In* NASA. Johnson (Lyndon B.) Space Center R and D Productivity: New Challenges for the US Space Program 1985 p 51-62 refs (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 05A

The relationships among manager behavior, group climate and managerial effectiveness are examined. Survey data were collected from 435 GM14-15 managers and their subordinates at NASA concerning management practices and perceptions of the group environment. Performance ratings of managers were obtained from their superiors. The results strongly supported a causal model in which subordinates' climate perceptions mediate the effects of manager behavior on performance. That is, the development of group climate provides the process through which the effects of manager practices may be understood. Analyses also revealed that the function performed by a manager and his group (e.g., research) influenced the specific nature of the causal dynamics. Some implications of the results for management training and development are discussed. Author

N86-15164*# Federal Express Corp., Memphis, Tenn.
MENTORING AS A COMMUNICATION CHANNEL: IMPLICATIONS FOR INNOVATION AND PRODUCTIVITY
Lee Avant and Robert W. Boozer (Memphis State Univ.) *In* NASA. Johnson (Lyndon B.) Space Center R and D Productivity: New Challenges for the US Space Program 1985 p 63-72 refs (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 05A

The impact of a formalized mentoring program as a communication channel for enhancing information distribution, innovation, and productivity is investigated. Formal and informal approaches to mentoring are discussed. Interviews with 11 members of formal mentor-protege teams indicate communications in the mentoring relationship can affect individual and organizational innovation and productivity. Author

N86-15165*# Harvard Univ., Cambridge, Mass. Business School.
MANAGING COOPERATIVE RESEARCH AND DEVELOPMENT VENTURES
William J. Murphy *In* NASA. Johnson (Lyndon B.) Space Center R and D Productivity: New Challenges for the US Space Program 1985 p 75-87 refs (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 05A

As cooperative ventures to conduct research and development become increasingly attractive, management of these collective undertakings poses new challenges to executives. In selecting the most appropriate organizational structure and strategy the author suggests that the collective enterprise executive must strike the best balance among three distinct but related elements: contribution of the participants; creation of benefits; and transfer of benefits to contributors. Eight types of cooperative R&D ventures are proposed with discussion of the unique management tasks associated with each type. R.J.F.

N86-15166*# National Aeronautics and Space Administration. Johnson (Lyndon B.) Space Center,
GOVERNMENT-TO-GOVERNMENT COOPERATION IN SPACE STATION DEVELOPMENT
Samuel H. Nassiff *In its* R and D Productivity: New Challenges for the US Space Program 1985 p 88-108 (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 05A

A memoranda of understanding was recently signed between the United States (NASA) and three international Space Station partners - Canada, European Space Agency (ESA), and Japan. The international partners are performing parallel Phase B preliminary design studies, concurrent with the U.S., on their proposed elements/systems for possible integration and operation with the U.S. Space Station System complex. During the 21-month Space Station Phase B study, a large amount of technical interface data will have to be transferred between the U.S. and the international partners. Scheduled bilateral technical coordination meetings will also be held. The coordination and large number of interfaces required to integrate the international requirements into the Space Station require a clean interface management organizational structure and operation procedures to accomplish the integration task. The international coordination management organizational structure, management tools, and communications network are discussed including the proposed international elements/systems being studied by the international partners. Author

N86-15167*# Universities Space Research Association, Huntsville, Ala.
PRODUCTIVITY ISSUES AT ORGANIZATIONAL INTERFACES
Albert W. Holland *In* NASA. Johnson (Lyndon B.) Space Center R and D Productivity: New Challenges for the US Space Program 1985 p 109-119 refs (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 05A

The need for close interdependence between large numbers of diverse and specialized work groups makes the Space Program extremely vulnerable to loss of productivity at organizational interfaces. Trends within the program also suggest that the number and diversity of interfaces will grow in the near term. Continued maintenance of R&D excellence will require that interface performance issues be included in any future productivity improvement effort. The types and characteristics of organizational interfaces are briefly presented, followed by a review of factors which impact their productivity. Approaches to assessing and improving interface effectiveness are also discussed. Author

N86-15168*# Purdue Univ., West Lafayette, Ind.
EFFICIENCY AND INNOVATION: STEPS TOWARD COLLABORATIVE INTERACTIONS
Cynthia A. Lengnick-Hall and Donald C. King *In* NASA. Johnson (Lyndon B.) Space Center R and D Productivity: New Challenges for the US Space Program 1985 p 121-131 refs (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 05A

Research and development units are faced with the challenging objective of being cost effective while developing high quality, innovative products. Advanced technology is only part of the solution. It is increasingly clear that organization structures and managerial processes must also be designed and structured to meet the dual objectives of quality and efficiency. The results of an empirical case analysis of a large R & D division which is attempting to meet this challenge is presented. Author

N86-15169*# TRW, Inc., Redondo Beach, Calif.
GAMMA RAY OBSERVATORY PRODUCTIVITY SHOWCASE
Richard L. Davis and Donald A. Molgaard *In* NASA. Johnson (Lyndon B.) Space Center R and D Productivity: New Challenges for the US Space Program 1985 p 132-141 refs (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 05A

The Gamma Ray Observatory (GRO) Program has been

proclaimed to be the showcase productivity program for NASA and TRW. Among the multiple disciplines of a large-scale program, there is opportunity and need for improved efficiency, effectiveness, and reduction in the cost of doing business. The efforts and tools that will or have been implemented to achieve this end are described. Since the GRO Program is mainly an engineering program with the build of one satellite, the primary emphasis is placed on improving the efficiency and quality of management and engineering. Author

N86-15170*# Texas Univ., Arlington.
A CASE STUDY IN R AND D PRODUCTIVITY: HELPING THE PROGRAM MANAGER COPE WITH JOB STRESS AND IMPROVE COMMUNICATION EFFECTIVENESS
Wayne D. Bodensteiner and Edwin A. Gerloff *In* NASA. Johnson (Lyndon B.) Space Center R and D Productivity: New Challenges for the US Space Program 1985 p 142-148 refs (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 05A

Certain structural changes in the Naval Material Command which resulted from a comparison of its operations to those of selected large-scale private sector companies are described. Central to the change was a reduction in the number of formal reports from systems commands to headquarters, and the provision of Program Management Assistance Teams (at the request of the program manager) to help resolve project problems. It is believed that these changes improved communication and information-processing, reduced program manager stress, and resulted in improved productivity. Author

N86-15171*# McDonnell-Douglas Technical Services Co., Inc., Houston, Tex.
TECHNICAL AND MANAGEMENT INFORMATION SYSTEM: THE TOOL FOR PROFESSIONAL PRODUCTIVITY ON THE SPACE STATION PROGRAM
Gonzalo Montoya and P. Boldon *In* NASA. Johnson (Lyndon B.) Space Center R and D Productivity: New Challenges for the US Space Program 1985 p 149-164 refs (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 05A

The Space Station Program is highly complex not only in its technological goals and requirements but also in its organizational structure. Eight Contractor teams supporting four NASA centers plus Headquarters must depend on effective exchange of information--the lifeblood of the program. The Technical and Management Information System (TMIS) is the means by which this exchange can take place. Value of the TMIS in increasing productivity comes primarily from its ability to make the right information available to whomever needs it when it is needed. Productivity of the aerospace professional and how it can be enhanced by the use of specifically recommended techniques and procedures for information management using the TMIS are discussed. Author

N86-15172*# Pennsylvania State Univ., University Park. Center for the Management of Technological and Organizational Change.
NEW TECHNOLOGY IMPLEMENTATION: TECHNICAL ECONOMIC AND POLITICAL FACTORS
James W. Dean, Jr., Gerald I. Susman, and Pamela S. Porter *In* NASA. Johnson (Lyndon B.) Space Center R and D Productivity: New Challenges for the US Space Program 1985 p 165-175 (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 05A

An analysis is presented of the process of implementing advanced manufacturing technology, based on studies of numerous organizations. This process is seen as consisting of a series of decisions with technical, economic, and political objectives. Frequency decisions involve specifications, equipment, resources/organization, and location. Problems in implementation are viewed as resulting from tradeoffs among the objectives, the tendency of decision makers to emphasize some objectives at the expense of others, and the propensity of problems to spread from one area to another. Three sets of recommendations, based on this analysis, are presented. Author

N86-15173*# Mitre Corp., Houston, Tex.
COMPUTER SYSTEMS MEASURES **c62**
F. T. Crucian *In* NASA. Johnson (Lyndon B.) Space Center R and D Productivity: New Challenges for the US Space Program 1985 p 177-191 (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 09B

In determining the productivity of a computing capacity, two of the costs to be considered are: the cost of lost productivity (user lost time) due to inadequate computer resources; and the cost of increasing the capacity of the computer system to reduce user's lost time. This document presents the results of a study conducted at NASA/JSC. The purpose of the study was to relate the cost of users' lost time to the cost of increased computer resources. The goal of the study was to identify the overall least cost to the computing facility. The document describes a survey designed to identify the user's lost time and the computer resource requirement to the reduce lost time. The results of the survey are presented showing the trade off between user's lost time and cost of increasing system capacity. Author

N86-15174*# National Aeronautics and Space Administration. Kennedy (John F.) Space Center, Cocoa Beach, Fla.
OFFICE AUTOMATION: THE ADMINISTRATIVE WINDOW INTO THE INTEGRATED DBMS **c82**
Georgia H. Brock *In* NASA. Johnson (Lyndon B.) Space Center R and D Productivity: New Challenges for the US Space Program 1985 p 192-201 (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 05B

In parallel to the evolution of Management Information Systems from simple data files to complex data bases, the stand-alone computer systems have been migrating toward fully integrated systems serving the work force. The next major productivity gain may very well be to make these highly sophisticated working level Data Base Management Systems (DMBS) serve all levels of management with reports of varying levels of detail. Most attempts by the DBMS development organization to provide useful information to management seem to bog down in the quagmire of competing working level requirements. Most large DBMS development organizations possess three to five year backlogs. Perhaps Office Automation is the vehicle that brings to pass the Management Information System that really serves management. A good office automation system manned by a team of facilitators seeking opportunities to serve end-users could go a long way toward defining a DBMS that serves management. This paper will briefly discuss the problems of the DBMS organization, alternative approaches to solving some of the major problems, a debate about problems that may have no solution, and finally how office automation fits into the development of the Manager's Management Information System. Author

N86-15175*# National Aeronautics and Space Administration. Johnson (Lyndon B.) Space Center,
IMPROVING MANAGEMENT DECISION PROCESSES THROUGH CENTRALIZED COMMUNICATION LINKAGES
Don F. Simanton and John R. Garman *In its* R and D Productivity: New Challenges for the US Space Program 1985 p 202-211 (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 05A

Information flow is a critical element to intelligent and timely decision-making. At NASA's Johnson Space Center the flow of information is being automated through the use of a centralized backbone network. The theoretical basis of this network, its implications to the horizontal and vertical flow of information, and the technical challenges involved in its implementation are the focus of this paper. The importance of the use of common tools among programs and some future concerns related to file transfer, graphics transfer, and merging of voice and data are also discussed. Author

N86-15176*# McDonnell-Douglas Astronautics Co., Houston, Tex.
A PERFORMANCE MEASUREMENT SYSTEM FOR ENGINEERING SERVICES
Richard L. West *In* NASA. Johnson (Lyndon B.) Space Center R and D Productivity: New Challenges for the US Space Program 1985 p 213-219 refs (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 05A

A performance measurement system which provides both a means of monitoring performance and a resource to support management decision making is described. The process of performance indicator development is discussed and typical indicators are described. The paper concludes with a summary of some of the lessons learned in applying productivity measurements to engineering services tasks and in automating data collection, evaluation and interpretation. B.W.

N86-15177*# Houston Univ., Clear Lake, Tex.
SOME KEY CONSIDERATIONS IN EVOLVING A COMPUTER SYSTEM AND SOFTWARE ENGINEERING SUPPORT ENVIRONMENT FOR THE SPACE STATION PROGRAM c61
Charles W. McKay and Rodney L. Bown *In* NASA. Johnson (Lyndon B.) Space Center R and D Productivity: New Challenges for the US Space Program 1985 p 221-230 refs (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 09B

The space station data management system involves networks of computing resources that must work cooperatively and reliably over an indefinite life span. This program requires a long schedule of modular growth and an even longer period of maintenance and operation. The development and operation of space station computing resources will involve a spectrum of systems and software life cycle activities distributed across a variety of hosts, an integration, verification, and validation host with test bed, and distributed targets. The requirement for the early establishment and use of an apporopriate Computer Systems and Software Engineering Support Environment is identified. This environment will support the Research and Development Productivity challenges presented by the space station computing system. Author

N86-15178*# Rockwell International Corp., Canoga Park, Calif.
PRODUCTIVITY IMPROVEMENT IN ENGINEERING AT ROCKETDYNE
R. M. Nordlund, S. T. Vogt, and A. K. Woo *In* NASA. Johnson (Lyndon B.) Space Center R and D Productivity: New Challenges for the US Space Program 1985 p 231-238 (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 05A

The Rocketdyne Division of Rockwell International has embarked on a productivity improvement program in engineering. This effort included participation in the White Collar Productivity Improvement (WCPI) project sponsored by the American Productivity Center. A number of things have been learned through this project. It seems that any productivity improvement project should be employee driven. The Rocketdyne project was essentially started as a result of a grassroots effort to remove some particular hindrances, and employee enthusiasm was a prime factor in the continuing progress of the effort. A significant result was that awareness of problems at all levels increased. Many issues surfaced in the diagnostic phase, and were then noted and discussed. This process added legitimacy to issues that had previously been merely unspoken concerns. The initial feelings of many members of the pilot group was that significant changes would occur relatively quickly. It is now recognized that this will have to be an ongoing, long-term effort. Author

N86-15179*# Motorola, Inc., Schaumburg, Ill.
IMPROVING ENGINEERING EFFECTIVENESS
Janet D. Fiero *In* NASA. Johnson (Lyndon B.) Space Center R and D Productivity: New Challenges for the US Space Program 1985 p 239-248 (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 05A

Methodologies to improve engineering productivity were investigated. The rocky road to improving engineering effectiveness is reviewed utilizing a specific semiconductor engineering organization as a case study. The organization had a performance problem regarding new product introductions. With the help of this consultant as a change agent the engineering team used a systems approach to through variables that were effecting their output significantly. Critical factors for improving this engineering organization's effectiveness and the roles/responsibilities of management, the individual engineers and the internal consultant are discussed. B.W.

N86-15180*# National Aeronautics and Space Administration. Johnson (Lyndon B.) Space Center,
SOFTWARE PRODUCTIVITY IMPROVEMENT THROUGH SOFTWARE ENGINEERING TECHNOLOGY c61
Frank E. McGarry *In* NASA. Johnson (Lyndon B.) Space Center R and D Productivity: New Challenges for the US Space Program 1985 p 249-263 refs (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 09B

It has been estimated that NASA expends anywhere from 6 to 10 percent of its annual budget on the acquisition, implementation and maintenance of computer software. Although researchers have produced numerous software engineering approaches over the past 5-10 years; each claiming to be more effective than the other, there is very limited quantitative information verifying the measurable impact htat any of these technologies may have in a production environment. At NASA/GSFC, an extended research effort aimed at identifying and measuring software techniques that favorably impact productivity of software development, has been active over the past 8 years. Specific, measurable, software development technologies have been applied and measured in a production environment. Resulting software development approaches have been shown to be effective in both improving quality as well as productivity in this one environment. Author

N86-15181*# Bendix Corp., Southfield, Mich.
IMPROVED PRODUCTIVITY THROUGH INTERACTIVE COMMUNICATION
Phillip P. Marino *In* NASA. Johnson (Lyndon B.) Space Center R and D Productivity: New Challenges for the US Space Program 1985 p 265-274 (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 05A

New methods and approaches are being tried and evaluated with the goal of increasing productivity and quality. The underlying concept in all of these approaches, methods or processes is that people require interactive communication to maximize the organization's strengths and minimize impediments to productivity improvement. This paper examines Bendix Field Engineering Corporation's organizational structure and experiences with employee involvement programs. The paper focuses on methods Bendix developed and implemented to open lines of communication throughout the organization. The Bendix approach to productivity and quality enhancement shows that interactive communication is critical to the successful implementation of any productivity improvement program. The paper concludes with an examination of the Bendix methodologies which can be adopted by any corporation in any industry. Author

N86-15182*# Westinghouse Mfg. Systems and Technology Center, Columbia, Md. Socio-Technical Engineering.
SOCIO-TECHNICAL INTEGRATION OF THE WORKPLACE c80
George L. Carter *In* NASA. Johnson (Lyndon B.) Space Center R and D Productivity: New Challenges for the US Space Program 1985 p 275-288 ref (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 05K

The objective of socio-technical theory and design is to provide the best match between the social system and the technical system. The achievement of a best match makes optimal use of the resources of both systems. Implementation of this theory is best served when there is involvement by the user organization. The involvement relative to the introduction of new technology in the organization is extremely significant. Employee involvement is

critical to effective participative management. The trends toward participative management and employee involvement have taken various forms. These have included quality circles, semi-autonomous teams and adhoc action teams. It is noteworthy to point out, as these processes have evolved, the role of a facilitator has become more prevalent. The facilitation of the socio-technical design system in industrial engineering is described. B.W.

N86-15183*# Arizona State Univ., Tempe. School of Public Affairs.

INFORMATION FLOW AND WORK PRODUCTIVITY THROUGH INTEGRATED INFORMATION TECHNOLOGY c82

Rolf T. Wigand *In* NASA. Johnson (Lyndon B.) R and D Productivity: New Challenges for the US Space Program 1985 p 289-309 refs (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 05B

The work environment surrounding integrated office systems is reviewed. The known effects of automated office technologies is synthesized and their known impact on work efficiency is reviewed. These effects are explored with regard to their impact on networks, work flow/processes, as well as organizational structure and power. Particular emphasis is given to structural changes due to the introduction of newer information technologies in organizations. The new information technologies have restructed the average organization's middle banks and, as a consequence, they have shrunk drastically. Organizational pyramids have flattened with fewer levels since executives have realized that they can get ahold of the needed information via the new technologies quicker and directly and do not have to rely on middle-level managers. Power shifts are typically accompanied with the introduction of these technologies resulting in the generation of a new form of organizational power. B.W.

N86-15184*# Hughes Aircraft Co., Los Angeles, Calif.

TRAINING MANAGERS FOR HIGH PRODUCTIVITY: GUIDELINES AND A CASE HISTORY

Robert M. Ranftl *In* NASA. Johnson (Lyndon B.) Space Center R and D Productivity: New Challenges for the US Space Program 1985 p 310-323 (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 05A

Hughes Aircrafts 13-year productivity study clearly identifies management as the key link in the entire productivity chain. This fact led to the establishment of a long-term series of seminars on personal, managerial, organizational, and operational productivity for all levels and sectors of line and staff management. To inspire the work force to higher levels of productivity and creativity management, itself, must first be inspired. In turn they have to clearly understand the productive and creative processes, fashion an effective productivity improvement plan with sound strategy and implementation, create an optimal environmental chemistry, and provide the outstanding leadership necessary to propel their organizations to achieve full potential. The primary goals of the seminars are to (1) ignite that spark of inspiration, enabling productive action to follow, (2) provide participants a credible roadmap and effective tools for implementation, and (3) develop a dedicated commitment to leadership and productivity throughout the management team. Author

N86-15185*# National Aeronautics and Space Administration. Johnson (Lyndon B.) Space Center,

INCREASED PRODUCTIVITY IN FLIGHT WITH VOICE COMMANDING

William T. Jordan *In its* R and D Productivity: New Challenges for the US Space Program 1985 p 325-329 (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 05A

Automatic Speech Recognition technology has matured to the point where it can provide a viable means of increasing productivity by naturalizing the man-machine interface. With ever increasing workloads being placed on astronauts, speech recognition may provide an alternative means of system controlling that would reduce the task burden. Voice commanding, allowing hands-free operation, can be especially effective during operations requiring simultaneous system control. A flight experiment is under development to demonstrate the operational effectiveness of voice control by commanding the Space Shuttle's Closed Circuit Television (CCIV) system. This experiment will help direct future applications of voice entry to space operations. Author

N86-15186*# Loyola Univ., Chicago, Ill.

GROUP STRUCTURE AND GROUP PROCESS FOR EFFECTIVE SPACE STATION ASTRONAUT TEAMS

John M. Nicholas and Ronald S. Kagan *In* NASA. Johnson (Lyndon B.) Space Center R and D Productivity: New Challenges for the US Space Program 1985 p 330-339 refs (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 05A

Space Station crews will encounter new problems, many derived from the social interaction of groups working in space for extended durations. Solutions to these problems must focus on the structure of groups and the interaction of individuals. A model of intervention is proposed to address problems of interpersonal relationships and emotional stress, and improve the morale, cohesiveness, and productivity of astronaut teams. Author

N86-15187*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif. Man-Machine Systems.

SPACE CREW PRODUCTIVITY: A DRIVING FACTOR IN SPACE STATION DESIGN

Harry L. Wolbers *In* NASA. Johnson (Lyndon B.) Space Center R and D Productivity: New Challenges for the US Space Program 1985 p 340-350 ref (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 05A

The criteria of performance, cost, and mission success probability (program confidence) are the principal factors that program or project managers and system engineers use in selecting the optimum design approach for meeting mission objectives. A frame of reference is discussed in which the interrelationships of these pertinent parameters can be made visible, and from which rational or informed decisions can be derived regarding the potential impact of adjustments in crew productivity on total Space Station System effectiveness. Author

N86-15188*# San Jose State Univ., Calif. Dept. of Organization and Management.

THE SPACE STATION AND HUMAN PRODUCTIVITY: AN AGENDA FOR RESEARCH

Claudia Bird Schoonhoven *In* NASA. Johnson (Lyndon B.) Space Center R and D Productivity: New Challenges for the US Space Program 1985 p 352-367 refs (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 05A

Organizational problems in permanent organizations in outer space were analyzed. The environment of space provides substantial opportunities for organizational research. Questions about how to organize professional workers in a technologically complex setting with novel dangers and uncertainties present in the immediate environment are examined. It is suggested that knowledge from organization theory/behavior is an underutilized resource in the U.S. space program. A U.S. space station will be operable by the mid-1990's. Organizational issues will take on increasing importance, because a space station requires the long term organization of human and robotic work in the isolated and confined environment of outer space. When an organizational analysis of the space station is undertaken, there are research implications at multiple levels of analysis: for the individual, small group, organizational, and environmental levels of analysis. The research relevant to organization theory and behavior is reviewed. E.A.K.

N86-15189*# State Univ. of New York, Buffalo. School of Architecture and Environmental Design.

POST-IOC SPACE STATION: MODELS OF OPERATION AND THEIR IMPLICATIONS FOR ORGANIZATIONAL BEHAVIOR, PERFORMANCE AND EFFECTIVENESS

Scott Danford, James Meindl, and Raymmond Hunt *In* NASA.

Johnson (Lyndon B.) Space Center R and D Productivity: New Challenges for the US Space Program 1985 p 368-376 refs (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 05A

Issues of crew productivity during design work on space station are discussed. The crew productivity is defined almost exclusively in terms of human factors engineering and habitability design concerns. While such spatial environmental conditions are necessary to support crew performance and productivity, they are not sufficient to ensure high levels of crew performance and productivity on the post-Initial Operational Configurations (IOC) space station. The role of the organizational environment as a complement to the spatial environment for influencing crew performance in such isolated and confined work settings is examined. Three possible models of operation for post-IOC space station's organizational environment are identified and it is explained how they and space station's spatial environment will combine and interact to occasion patterns of crew behavior is suggested. A three phase program of research design: (1) identify patterns of crew behavior likely to be occasioned on post-IOC space station for each of the three models of operation; and (2) to determine proactive/preventative management strategies which could be adopted to maximize the emergence of preferred outcomes in crew behavior under each of the several spatial and organizational environment combinations. E.A.K.

N86-15190*# National Aeronautics and Space Administration. Johnson (Lyndon B.) Space Center,
THE ROLE OF ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS IN INCREASING STS OPERATIONS PRODUCTIVITY
c63
Chris Culbert *In its* R and D Productivity: New Challenges for the US Space Program 1985 p 378-382 (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 09B

Artificial Intelligence (AL) is discussed. A number of the computer technologies pioneered in the AL world can make significant contributions to increasing STS operations productivity. Application of expert systems, natural language, speech recognition, and other key technologies can reduce manpower while raising productivity. Many aspects of STS support lend themselves to this type of automation. The artificial intelligence section of the mission planning and analysis division has developed a number of functioning prototype systems which demonstrate the potential gains of applying AL technology. E.A.K.

N86-15191*# McDonnell-Douglas Technical Services Co., Inc., Houston, Tex.
APPLICATION OF MODERN TOOLS AND TECHNIQUES TO MAXIMIZE ENGINEERING PRODUCTIVITY IN THE DEVELOPMENT OF ORBITAL OPERATIONS PLANS FOR THE SPACE STATION PROGRM
John S. Manford and Gregory R. Bennett *In* NASA. Johnson (Lyndon B.) Space Center R and D Productivity: New Challenges for the US Space Program 1985 p 383-393 (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 05A

The Space Station Program will incorporate analysis of operations constraints and considerations in the early design phases to avoid the need for later modifications to the Space Station for operations. The application of modern tools and administrative techniques to minimize the cost of performing effective orbital operations planning and design analysis in the preliminary design phase of the Space Station Program is discussed. Tools and techniques discussed include: approach for rigorous analysis of operations functions, use of the resources of a large computer network, and providing for efficient research and access to information. E.A.K.

N86-15192*# McDonnell-Douglas Technical Services Co., Inc., Houston, Tex.
ON ORBIT MISSION PLANNING USING THE SHUTTLE TRAJECTORY AND LAUNCH WINDOW EXPERT SYSTEM
Peter R. Ahlf *In* NASA. Johnson (Lyndon B.) Space Center R and D Productivity: New Challenges for the US Space Program 1985 p 394-403 refs (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 05A

With the Space Transportation System (STS) entering the operational era, the need for standardized, automated, mission planning computer tools has become apparent. In order to support an increased flight rate without an increase in manpower, quicker and more efficient methods are needed to perform standard tasks. The Shuttle Trajectory and Launch Window Expert System (STALEX) was developed to automate many aspects of early mission planning for space shuttle missions carrying geosynchronous communications satellites. Most of the commercial Shuttle missions planned for the next 3 years will carry at least one of this type of satellite. The applications of STALEX include payload deployment scheduling, launch window analysis, orbital trajectory determination, and landing opportunity selection. E.A.K.

N86-15193*# McDonnell-Douglas Technical Services Co., Inc., Houston, Tex.
AUTOMATED CREW PROCEDURE MAINTENANCE
Paul Hollingshead *In* NASA. Johnson (Lyndon B.) Space Center R and D Productivity: New Challenges for the US Space Program 1985 p 289-309 (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 05A

The preparation of 30 controlled documents for each flight of the Space Shuttle involves 90 people in processing 200 or 300 changes to existing checklists, and building new procedures. A prototype system is discussed which stores and displays those precise sets of instructions, which include rationale and change history, by using readily available hardware. It provides a simple method of structuring the data in a form for easy undertanding and maintenance. E.A.K.

N86-15194*# McDonnell-Douglas Technical Services Co., Inc., Houston, Tex.
STREAMLINING: REDUCING COSTS AND INCREASING STS OPERATIONS EFFECTIVENESS
Ronald K. Petersburg *In* NASA. Johnson (Lyndon B.) Space Center R and D Productivity: New Challenges for the US Space Program 1985 p 415-424 (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 05A

The development of streamlining as a concept, its inclusion in the space transportation system engineering and operations support (STSEOS) contract, and how it serves as an incentive to management and technical support personnel is discussed. The mechanics of encouraging and processing streamlining suggestions, reviews, feedback to submitters, recognition, and how individual employee performance evaluations are used to motivation are discussed. Several items that were implemented are mentioned. Information reported and the methodology of determining estimated dollar savings are outlined. The overall effect of this activity on the ability of the McDonnell Douglas flight preparation and mission operations team to support a rapidly increasing flight rate without a proportional increase in cost is illustrated. E.A.K.

N86-15195*# McDonnell-Douglas Technical Services Co., Inc., Houston, Tex.
ACTIONS FOR PRODUCTIVITY IMPROVEMENT IN CREW TRAINING
Gerald E. Miller *In* NASA. Johnson (Lyndon B.) Space Center R and D Productivity: New Challenges for the US Space Program 1985 p 425-436 (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 05A

Improvement of the productivity of astronaut crew instructors in the Space Shuttle program and beyond is proposed. It is suggested that instructor certification plans should be established to shorten the time required for trainers to develop their skills and improve their ability to convey those skills. Members of the training cadre should be thoroughly cross trained in their task. This provides better understanding of the overall task and greater

flexibility in instructor utilization. Improved facility access will give instructors the benefit of practical application experience. Former crews should be integrated into the training of upcoming crews to bridge some of the gap between simulated conditions and the real world. The information contained in lengthy and complex training manuals can be presented more clearly and efficiently as computer lessons. The illustration, animation and interactive capabilities of the computer combine an effective means of explanation. E.A.K.

N86-15196*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
GROUND PROCESSING OF THE MCDONNELL DOUGLAS PAYLOAD ASSIST MODULE (PAM)
C. E. Bryan and D. A. Maclean *In* NASA. Johnson (Lyndon B.) Space Center R and D Productivity: New Challenges for the US Space Program 1985 p 437-449 (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 05A

The payload assist module (PAM) ground processing operations which have evolved since they were started in 1982 are described. The objective of the changes was to reduce the prelaunch testing of the airborne support equipment to increase the throughput of PAM systems while not compromising the reliability of the system when functioned on-orbit. The changes that resulted from the initial cargo element ground processing, the on-orbit performance of the systems, plus the postflight refurbishment and recertification of the airborne support equipment resulted in significant reductions in labor expenditures and work shifts required to prepare a PAM system for flight. E.A.K.

N86-15197*# McDonnell-Douglas Technical Services Co., Inc., Houston, Tex. Descent Design Section.
SPACE SHUTTLE DESCENT DESIGN: FROM DEVELOPMENT TO OPERATIONS
Timothy J. Crull and R. Edward Hite, III *In* NASA. Johnson (Lyndon B.) Space Center R and D Productivity: New Challenges for the US Space Program 1985 p 450-459 (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 05A

The descent guidance system, the descent trajectories design, and generating of the associated flight products are discussed. The programs which allow the successful transitions from development to STS operations, resulting in reduced manpower requirements and compressed schedules for flight design cycles are addressed. The topics include: (1) continually upgraded tools for the job, i.e., consolidating tools via electronic data transfers, tailoring general purpose software for needs, easy access to tools through an interactive approach, and appropriate flexibility to allow design changes and provide growth capability; (2) stabilizing the flight profile designs (I-loads) in an uncertain environment; and (3) standardizing external interfaces within performance and subsystems constraints of the Orbiter. E.A.K.

N86-15198*# National Aeronautics and Space Administration. Johnson (Lyndon B.) Space Center,
PRODUCTIVITY INCREASE THROUGH IMPLEMENTATION OF CAD/CAE WORKSTATION
Linda K. Bromley *In its* R and D Productivity: New Challenges for the US Space Program 1985 p 461-473 (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 05A

The tracking and communication division computer aided design/computer aided engineering system is now operational. The system is utilized in an effort to automate certain tasks that were previously performed manually. These tasks include detailed test configuration diagrams of systems under certification test in the ESTL, floorplan layouts of future planned laboratory reconfigurations, and other graphical documentation of division activities. The significant time savings achieved with this CAD/CAE system are examined: (1) input of drawings and diagrams; (2) editing of initial drawings; (3) accessibility of the data; and (4) added versatility. It is shown that the Applicon CAD/CAE system, with its ease of input and editing, the accessibility of data, and its added versatility, has made more efficient many of the necessary but often time-consuming tasks associated with engineering design and testing. E.A.K.

N86-15199*# Honeywell, Inc., Clearwater, Fla.
R AND D PRODUCTIVITY IMPROVEMENT AT HONEYWELL: A CASE STUDY
William E. Lyons *In* NASA. Johnson (Lyndon B.) Space Center R and D Productivity: New Challenges for the US Space Program 1985 p 474-480 (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 05A

The problems encountered when computer-aided-design/documentation was applied to a large design program at Honeywell; how a study team was established to solve the problem; the techniques used by the team and the resulting solutions are described. The techniques used in this instance may be applied to other problem areas in the R&D process to improve productivity. E.A.K.

N86-15200*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.
INCREASING PRODUCTIVITY OF THE MCAUTO CAD/CAE SYSTEM BY USER-SPECIFIC APPLICATIONS PROGRAMMING c61
Susan M. Plotrowski and Tom H. Vu *In* NASA. Johnson (Lyndon B.) Space Center R and D Productivity: New Challenges for the US Space Program 1985 p 481-488 refs (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 09B

Significant improvements in the productivity of the McAuto Computer-Aided Design/Computer-Aided Engineering (CAD/CAE) system were achieved by applications programming using the system's own Graphics Interactive Programming language (GRIP) and the interface capabilities with the main computer on which the system resides. The GRIP programs for creating springs, bar charts, finite element model representations and aiding management planning are presented as examples. E.A.K.

N86-15201*# Martin Marietta Aerospace, New Orleans, La.
QUALITY CIRCLES: ORGANIZATIONAL ADAPTATIONS, IMPROVEMENTS AND RESULTS c38
Ralph Tortorich *In* NASA. Johnson (Lyndon B.) Space Center R and D Productivity: New Challenges for the US Space Program 1985 p 490-494 ref (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 14D

The effective application in industry and government of quality circles work was demonstrated. The results achieved in quality and productivity improvements and cost savings are impressive. The circle process should be institutionalized within industry and government. The stages of circle program growth, innovations that help achieve circle process institutionalization, and the result achieved at Martin Marietta's Michoud Division and within the National Aeronautics and Space Administration (NASA) are addressed. E.A.K.

N86-15202*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.
PRODUCTIVITY ENHANCEMENT PLANNING USING PARTICIPATIVE MANAGEMENT CONCEPTS
Marvin E. White and James C. Kukla *In* NASA. Johnson (Lyndon B.) Space Center R and D Productivity: New Challenges for the US Space Program 1985 p 495-505 (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 05A

A productivity enhancement project which used participative management for both planning and implementation is described. The process and results associated with using participative management to plan and implement a computer terminal upgrade project where the computer terminals are used by research and development (R&D) personnel are reported. The upgrade improved the productivity of R&D personnel substantially, and their commitment of the implementation is high. Successful utilization of

participative management for this project has laid a foundation for continued style shift toward participation within the organization. E.A.K.

N86-15203*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.
RESULTS OF INNOVATIVE COMMUNICATION PROCESSES ON PRODUCTIVITY GAINS IN A HIGH TECHNOLOGY ENVIRONMENT
Brenda J. Kelly *In* NASA. Johnson (Lyndon B.) Space Center R and D Productivity: New Challenges for the US Space Program 1985 p 506-515 (For primary document see N86-15157 05-81)
Avail: NTIS HC A25/MF A01 CSCL 05A

The technology which resulted in performance breakthroughs at engineering and management services is discussed. As a result of the innovative approaches of communicating productivity concepts to the employees, specific outcomes can now be pinpointed at all levels of the organization such as: (1) employee-headed program; (2) performance feedback processes; and (3) an investigative approach to creating leadership. The Lockheed Corporation began the innovative trend in 1974 when they became the first company to introduce quality circles in America. Although some of Lockheed-EMSCO's processes may sound different from traditional improvement processes, the context out of which those to be presented evolved has sustained more than 10 years of positive results through employee involvement activities. E.A.K.

N86-15204# Naval Postgraduate School, Monterey, Calif.
STANDARDIZATION OF MANAGEMENT CONTROL/FINANCIAL MANAGEMENT SYSTEMS UTILIZED FOR THE O AND M, NR APPROPRIATION M.S. Thesis
T. M. Grieninger and R. J. Shaffer Jun. 1985 201 p
(AD-A159178) Avail: NTIS HC A10/MF A01 CSCL 05/1

This thesis provides an overview of the management control and financial management systems currently utilized within the Naval Reserve Claimancy for management of the Operation and Maintenance, Naval Reserve (O&M,NR) Appropriation. An analysis of these systems and identification of control and performance weaknesses resulting from their utilization provides the basis for development of a standardized financial management system. The standardized financial management system developed by the authors is detailed in the enclosed handbook for use by operating budget holders and OPTAR holders in the Naval Reserve Claimancy. GRA

N86-15205# Air War Coll., Maxwell AFB, Ala.
THE F/A-18 FIGHTER/ATTACK AIRCRAFT PROGRAM
P. G. Nicholson May 1985 72 p
(AD-A159292; AD-F250300; AU-AWC-85-157) Avail: NTIS HC A04/MF A01 CSCL 05/1

The history of the F/A-18 Fighter/Attack aircraft program is traced from its beginning as a result of the Naval Air Combat Fighter competition to 1984 when its future seems assured. Factors which affected the acquisition process are examined with a view to identifying those which might have significant influence on future tactical aircraft programs. Not surprisingly, the dominant factor is shown to be program cost and a number of strategies to minimize the effects of budgetary constraints are identified. The need for long-term planning and a rational comprehensive approach to controllable, programmatic factors is seen as essential in order to maintain adequate production levels in the face of less controllable economic factors. A coordinated approach to the operational requirements of the four United States tactical air forces is considered mandatory in order to promote commonality and develop multiple solutions. If this is not achieved, the F/A-18 program indicates that Congress is likely to intervene and play a more active role in areas where professional military expertise has traditionally held sway. GRA

N86-15206# Carnegie-Mellon Univ., Pittsburgh, Pa. Robotics Inst.
THE USE OF MULTIPLE PROBLEM DECOMPOSITIONS IN TIME CONSTRAINED PLANNING TASKS Interim Report
S. F. Smith and P. S. Ow Jul. 1985 12 p
(Contract F49620-82-K-0017)
(AD-A159626; CMU-RI-TR-85-11) Avail: NTIS HC A02/MF A01 CSCL 12/2

Problems requiring the synthesis of a collection of plans accomplishing distinct (but mostly related) goals has received increasing attention within AI. Such problems are typically formulated as multi-agent planning problems, emphasizing a problem decomposition wherein individual agents assume responsibility for the generation of individual plans while taking into account the goals and beliefs of other agents in the system. One consequence of such a problem decomposition is a simplified view of resource allocation that assumes avoidance of conflicts to be the sole concern. The validity of this assumption comes into question in time constrained problem domains requiring the allocation of multiple, shared resources. In job shop scheduling, for example, where sequences of manufacturing operations must be determined and scheduled for multiple orders, it is necessary to consider much more than availability to efficiently allocate resources over time. We argue that in such domains, an ability to reason from both resource-based and agent-based perspectives is essential to appropriate consideration of all domain constraints. GRA

N86-15207# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
STUDY ON INDUSTRIAL USAGE OF IN-ORBIT SATELLITE DATA Final Report
B. Schuerenberg Paris ESA Feb. 1985 206 p refs
(Contract ESA-5200/82/NL-PP(SC))
(ESA-CR(P)-2071) Avail: NTIS HC A10/MF A01

Organizational and managerial steps, and engineering tools necessary to optimize the engineering return from satellite housekeeping data were investigated. Starting from the satellite programs ISEE-2, Ulysses (ISPM), OTS, and ATS-6, the technological environment for future housekeeping concepts was assessed, and recommendations on how to improve the effectiveness and the significance of the technological return from in-orbit data were elaborated. Introduction of Technological Research Opportunities into space projects is recommended. Author (ESA)

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software.*

N86-15208 Texas Univ., Austin.
A COMPARATIVE STUDY OF OCLC, INC. AND THE WASHINGTON LIBRARY NETWORK IN TWENTY-NINE PACIFIC NORTHWEST ACADEMIC LIBRARIES Ph.D. Thesis
Barbara Lou DeCoster 1984 241 p
Avail: Univ. Microfilms Order No. DA8513207

Two hundred and two surveys were mailed to librarians at twenty-nine Pacific Northwest academic libraries that were members of either the Washington Library Network or OCLC, Inc. The librarians were asked to rate their degree of satisfaction with twenty-one aspects of their bibliographic database and the degree of usefulness of twenty-four database capabilities, regardless of their current availability, on a five-point Likert-type scale. One hundred fifty-five (77 percent) of the librarians responded. Chi-square tests were used to compare their responses. In an overall satisfaction rating, WLN librarians were significantly more satisfied with their bibliographic database than were the OCLC librarians. WLN librarians rated significantly higher than the usefulness of the abilities to order materials online from vendors and to perform title keyword searches. OCLC librarians rated significantly higher the usefulness of the abilities to perform interlibrary load transactions online, to limit searches by date(s), and to limit searches by format. WLN librarians rated satisfaction

with the number of access points available to them significantly higher than did OCLC librarians. OCLC librarians rated their training manuals significantly higher. Dissert. Abstr.

N86-15209*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GUIDELINES FOR SUBMITTING DATA TO THE NATIONAL SPACE SCIENCE DATA CENTER
Jul. 1984 7 p
(NASA-TM-87500; NSSDC/WDC-A-RS-84-19; NAS 1.15:87500) Avail: NTIS HC A02/MF A01 CSCL 05B

The mission of the National Space Science Data Center (NSSDC) is to disseminate space science data for further analysis beyond that provided by the principal investigators (PIs) or team leaders (TLs) and their coworkers. Consequently, the NSSDC is responsible for the acquisition, organization, storage, retrieval, announcement, and distribution of scientific data obtained mainly from satellites and spacecraft. Any scientist may acquired data from the NSSDC and use them in further studies, either alone or in conjunction with data from ground-based or spacecraft experiments. With the responsibility for archiving data is the concomitant responsibility for distributing the documentation necessary to make those data usable. Since the group most knowledgeable about a particular experiment and its data is the PI or TL and his coworkers, and since the NSSDC cannot possibly supply the qualified personnel needed to write this documentation comprehensively, it is the responsibility of the PI or TL to provide the essential documentation. The NSSDC will support this effort by defining what is needed, by reviewing what is provided, and by reproducing and distributing the resulting documentation with the data. For a high-use data set, the NSSDC may publish the documentation as a Data Users Note; for a low-use data set, the NSSDC may distribute a Xerox, microfilm, or microfiche copy of the documentation. Author

N86-15210# Federal Aviation Administration, Washington, D.C. Associate Administrator for Development and Logistics.
HANDBOOK FOR PREPARING AND PRINTING FAA FORMAL TECHNICAL REPORTS
Mar. 1985 25 p
(AD-A157689; FAA/DL-85/1) Avail: NTIS HC A02/MF A01 CSCL 05/2

This document provides procedures for the preparation of Federal Aviation Administration (FAA) formal technical reports to ensure that results of programs are documented and printed in a uniform and cost-effective manner. This document contains procedures for mostly paper and microfiche copy. However, paragraph 8 contains new information on the submission of phonograph records and cassettes, computer program magnetic tape reports, computer floppy disks, and video tapes. The application of this standard aids in the interchange of technical information and in the reduction of costs in preparation, publication, and dissemination of such information. Reports are the principal means by which the FAA informs other Government departments/agencies and the aviation community of its performance of programs to meet the National Airspace System. GRA

N86-15211# Defense Technical Information Center, Alexandria, Va.
INTEGRATED BIBLIOGRAPHIC INFORMATION SYSTEM: INTEGRATING RESOURCES BY INTEGRATING INFORMATION TECHNOLOGIES Final Report
G. A. Cotter and R. W. Hartt May 1985 10 p
(AD-A157700; DTIC/TR-85/8) Avail: NTIS HC A02/MF A01 CSCL 05/2

The Defense Technical Information Center (DTIC) is sponsoring the development of an integrated bibliographic information system. The prototype of this system, under development since April 1983, will be used to demonstrate the concept of an integrated library system combined with an intelligent gateway capable of querying and updating -- simultaneously -- more than one heterogeneous bibliographic data base (catalog). Queries and updates of any data base will be performed using a common command language, relieving the system user of the need to learn and master separate languages and procedures for each data base accessed. The development approach used, the information processing concepts and technologies investigated and selected for implementation in the prototype system, and the issues underpinning system implementation are described. GRA

N86-15212# Defense Technical Information Center, Alexandria, Va.
ANALYSIS OF THE FEDERAL CATALOGING SYSTEM AND COSATI (COMMITTEE ON SCIENTIFIC AND TECHNICAL INFORMATION) CATALOGING
G. A. Schlag 21 Jun. 1985 41 p
(AD-A158501) Avail: NTIS HC A03/MF A01 CSCL 05/2

This paper is a comparative analysis of the cataloging processes done by the defense logistics services center (DLSC) and the defense technical information center (DTIC). The Federal catalog system used by DLSC was developed for the cataloging of supply items and materiel management; the COSATI System used by DTIC is for the cataloging of technical reports and technical bibliographic data. Major differences were found between the two systems including the materials, the end user, the type of information needed, and the information usage. GRA

N86-15213# Defense Technical Information Center, Alexandria, Va.
EXAMINING LEARNING THEORY OF ONLINE INFORMATION RETRIEVAL SYSTEMS AND APPLICATIONS IN COMPUTER-AIDED INSTRUCTION: IMPLICATIONS FOR THE DEFENSE TECHNICAL INFORMATION CENTER'S COMPUTER-AIDED INSTRUCTION Final Report
S. A. Witges Sep. 1985 39 p
(AD-A159001; DTIC/TR-85/11) Avail: NTIS HC A03/MF A01 CSCL 05/10

The Defense Technical Information Center (DTIC) is developing a computer-aided instruction (CAI) tutorial course entitled Introduction to DROLS Retrieval in order to train users of its online information retrieval system, the Defense RDT&E Online System (DROLS). In order to get maximum benefits of CAI to DTIC, this paper examined three areas: (1) Learning theory as it relates to online retrieval systems. That is, how do humans learn these systems; and (2) Learning theory and its application to CAI; and (3) An advance draft of DTIC's in-house-developed CAI course entitled Introduction to Recommendations are presented in all three areas. GRA

N86-15214# Aeronautical Research Labs., Melbourne (Australia).
A GUIDE TO THE PREPARATION OF DRAFT MANUSCRIPTS FOR ARL PUBLICATIONS
J. Y. Mann Apr. 1985 22 p
(AD-A159495; ARL/GD-013) Avail: NTIS HC A02/MF A01 CSCL 05/2

This Australian Defense document has been written as a basic guide for the preparation of drafts of publications in the Aeronautical Research Laboratories (ARL) series; but it is nevertheless relevant to the preparation of external papers. It is not intended as a treatise on techniques for the collation, reviewing and the detailed order of presentation of material (which are essential steps in the publication of scientific research), nor does it discuss (except in passing) the questions of author's style or good English, or the various actions in the ARL publication process. The major objective of this document is to draw attention to a number of points which, if consistently followed, will make the task of your reader in checking, referencing or simply reading your draft much more enjoyable and far less tedious. Unnecessary time, effort and costs associated with the correction and publication of your work and the proof checking of text and illustrations will also be reduced. GRA

N86-15174*# National Aeronautics and Space Administration. Kennedy (John F.) Space Center, Cocoa Beach, Fla.
OFFICE AUTOMATION: THE ADMINISTRATIVE WINDOW INTO THE INTEGRATED DBMS

Georgia H. Brock *In* NASA. Johnson (Lyndon B.) Space Center R and D Productivity: New Challenges for the US Space Program 1985 p 192-201 (For primary document see N86-15157 05-81) Avail: NTIS HC A25/MF A01 CSCL 05B

N86-15183*# Arizona State Univ., Tempe. School of Public Affairs.
INFORMATION FLOW AND WORK PRODUCTIVITY THROUGH INTEGRATED INFORMATION TECHNOLOGY
Rolf T. Wigand *In* NASA. Johnson (Lyndon B.) R and D Productivity: New Challenges for the US Space Program 1985 p 289-309 refs (For primary document see N86-15157 05-81) Avail: NTIS HC A25/MF A01 CSCL 05B

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

No abstracts in this category.

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

No abstracts in this category.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N86-15215# Naval Research Lab., Washington, D. C.
NAVAL RESEARCH LABORATORY 1984 REVIEW
16 Jul. 1985 304 p Original contains color illustrations
(AD-A159000) Avail: NTIS HC A14/MF A01 CSCL 05/2

Topics of scientific articles included in this annual report from the Naval Research Lab. discuss: NRL research in numerical simulation, fire research, and software cost reduction; Artificial intelligence, information processing, and signal transmission--propagation, scattering, transducer materials, and acoustic property measurement techniques; Radar interference rejection, ship signatures, and microwave seafloor sensing; Space and environmental research--Solar flares, X-ray sources, and ocean variability; Laser research and applications, laser diodes, and fiber optics; Materials modification and behavior--Biochemistry, ceramics, polymer cure, damage assessment facility, nitrogen discharge-breakdown studies; Materials analysis and properties--Microscale analysis, materials failure, lubricants, and submarine hull damage studies; Space dosimeter, Josephson junctions, microwave and X-ray sources, and gravimetry; Fluid mechanics and application--Detonation modeling, water waves and their interactions with currents, and chaos. GRA

N86-14417# Osaka Univ. (Japan). Dept. of Environmental Engineering.
CITIZEN PARTICIPATION IN THE 3-D URBAN DATA GENERATING PROCESS
Shin Yoshikawa and Tsuyoshi Sasadi *In its* Technology Reports of the Osaka University, Vol. 35, Nos. 1800-1818 Oct. 1985 p 323-330 refs (For primary document see N86-14405 05-31) Avail: NTIS HC A09/MF A01

88 SPACE SCIENCES (GENERAL)

No abstracts in this category.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N86-15216 California Univ., Berkeley.
MILLIMETER-WAVE APERTURE SYNTHESIS OBSERVATIONS OF W3(OH) Ph.D. Thesis
Jean-Lewis Turner 1984 133 p
Avail: Univ. Microfilms Order No. DA8513019

GHz aperture synthesis maps of the HCN molecular and continuum emission from the compact HII region W3(OH) are presented. The observations were made with the Hat Creek millimeter interferometer of the University of California, Berkeley. The resolution achieved in the maps is 1.2'. The maps reveal an HCN emission feature near the position of the water masers in W3(OH), which are located 7' east of the main continuum source. The emission feature has a peak flux density of 0.9 Jy, corresponding to a brightness temperature of 85K. The linewidth of the feature is 33 km/s. The molecular mass implied by the HCN emission is greater than 6 M sub 0. There are also HCN emission and absorption features toward the main continuum source. The emission features appear on the north and south of the continuum peak, at velocities of -44 km/s and -36 km/s, respectively. The HCN absorption feature is centered at -48 dm/s. The implications of the discovery of a high brightness HCN clump is discussed. The lack of observable radio continuum or infrared emission, in conjunction with the very high luminosity of the source, suggest that the HCN clump may represent a cocoon surrounding the youngest stellar object yet observed. Dissert. Abstr.

N86-15217 Princeton Univ., N. J.
A NOVEL INTERFEROMETER TO SEARCH FOR MEDIUM SCALE ANISOTROPY IN THE 2.7K BACKGROUND RADIATION Ph.D. Thesis
Peter Taylor Timbie 1985 113 p
Avail: Univ. Microfilms Order No. DA8512107

An instrument to measure anisotropy in the 2.7K cosmic blackbody radiation at an angular scale of 2.2 deg and a microwave frequency of 46GHz is described. A detection of anisotropy or placement of a limit on delta I/T would help reveal the spectrum of density fluctuations in the early universe at the time of decoupling of the radiation from matter. A novel type of interferometer to compare the temperature of 2 spots on either side of the North Celestial Pole with the temperature at the pole itself was employed. During one 24 hour rotation of the sky a circle about the pole was scanned. The interferometer minimizes systematic effects from ground radiation and reduces the effect of atmospheric fluctuations on this ground based experiment. Dissert. Abstr.

N86-15218 California Univ., Berkeley.
AN AUTOMATED SEARCH FOR SUPERNOVAE Ph.D. Thesis
Jordin T. Kare 1984 169 p
Avail: Univ. Microfilms Order No. DA8512874

Supernovae are among the most important, as well as most spectacular, of astrophysical events. However, because supernovae are both unpredictable and short-lived, they are difficult to study in real time with traditional observational techniques. In

particular, we have very little information about the development of supernovae in their first few days--a few luminosity measurements, very few spectra, and no observations in the radio, infrared, X-ray, and Gamma ray bands. There is thus a great need for a system capable of locating large numbers of bright supernovae at early times. This thesis describes the design, development, and testing of such a search system for supernovae, based on the use of current computer and detector technology. This search uses a computer-controlled telescope and charge coupled device (CCD) detector to collect images of hundreds of galaxies per night of observation, and a dedicated minicomputer to process these images in real time. Author

N86-15219*# Ohio State Univ., Columbus. Dept. of Astronomy.
CONTINUED ULTRAVIOLET STUDIES OF SOME Be STARS OF LATER TYPE Final Technical Report, 15 May 1980 - 31 Aug. 1985
Arne Slettebak Nov. 1985 78 p refs
(Grant NAG5-52)
(NASA-CR-176356; NAS 1.26:176356) Avail: NTIS HC A05/MF A01 CSCL 03A

Anomalous ionization (C IV and Si IV) is seen in IUE spectra of Be stars as late as B8, and occurs also in standard stars of similar spectral type. Asymmetrical lines suggesting mass loss are present in all the Be stars and several of the standard stars as well, with no obvious correlation with v sin i. Emission shoulders are present in the Mg II lines of two B5e stars but not in Be stars of later type. Again there is no correlation with v sin i. The A-F shell stars show rich Fe II absorption spectra in the ultraviolet, in one case with velocity structure. Author

N86-15220*# Honeywell, Inc., Lexington, Mass.
A MOSAIC INFRARED SENSOR FOR SPACE ASTRONOMY, PHASE 3 Quarterly Report
Ashok K. Sood 30 Jun. 1985 8 p
(Contract NASw-3688)
(NASA-CR-176370; NAS 1.26:176370; QR-3) Avail: NTIS HC A02/MF A01 CSCL 03A

Short wavelength (1 to 3 micron) HgCdTe mosaic detector arrays for space astronomy purposes were fabricated and studied. Honeywell will test and analyze these arrays at moderate temperatures (300-130K). Low temperature testing will be performed at the University of Hawaii. Short wavelength mosaic arrays were fabricated on three wafers and one array from each wafer was tested and analyzed. The p-type base carrier concentration on these wafers was an order of magnitude lower than typically used so far on this program (10 to the 14/cc as compared to 10 to the 15/cc). Tunneling currents are expected to decrease with this decrease in carrier concentration, resulting in improved performance at very low temperatures. The risk with such a low carrier concentration is that fixed charge in the surface passivating layer must be carefully controlled to prevent surface inversion layers. G.L.C.

N86-15221*# Auburn Univ., Ala. Dept. of Civil Engineering.
FRACTURE ANALYSIS OF RADIAL SCIENTIFIC INSTRUMENT MODULE REGISTRATION FITTINGS OF THE SPACE TELESCOPE Interim Report, 15 Jan. - 30 Aug. 1985
C. W. Springfield, Jr. 3 Sep. 1985 51 p refs
(Contract NAS8-36287)
(NASA-CR-176399; NAS 1.26:176399) Avail: NTIS HC A04/MF A01 CSCL 03A

The space telescope contains various scientific instrument (SI) modules which are mounted to the Focal Plane Structure (FPS) in a statically determinate manner. This is accomplished by using three registration fittings per SI module, one resisting three translations, another resisting two and the third resisting only one. Due to thermal insulating requirements these fittings are complex devices composed of numerous pieces. The structural integrity of these fittings is of great importance to the safety of the orbiter transporting the telescope, so in addition to the stress analyses performed during the design of these components, fracture susceptibility also needs to be considered. The pieces of the registration fittings for the Radial SI Module containing the Wide Field Planetary Camera are examined to determine which would endanger the orbiter if they fractured and what is the likelihood of their fracture. The latter is stated in terms of maximum allowable initial flaw sizes in these pieces. Author

N86-15222*# Washington Univ., Seattle. Dept. of Astronomy.
THE X-RAY PROPERTIES OF HIGH REDSHIFT, OPTICALLY SELECTED QSOS Ph.D. Thesis
Scott F. Anderson 1985 83 p refs
(Grant NAG8-433)
(NASA-CR-176339; NAS 1.26:176339) Avail: NTIS HC A05/MF A01 CSCL 03A

In order to study the X-ray properties of high redshift QSOs, grism/grens plates covering 17 deg. of sky previously imaged to very sensitive X-ray flux levels with the Einstein Observatory were taken. Following optical selection of the QSO, the archived X-ray image is examined to extract an X-ray flux detection or a sensitive upper limit. G.L.C.

N86-15223*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
FAR INFRARED AND SUBMILLIMETER BRIGHTNESS TEMPERATURES OF THE GIANT PLANETS
R. H. Hildebrand, R. F. Loewenstein, D. A. Harper, G. S. Orton (JPL, Pasadena, California), Jocelyn Keene, and S. E. Whitcomb Nov. 1985 76 p refs
(NASA-TM-88179; Rept-86003; NAS 1.15:88179; Preprint-Series-33) Avail: NTIS HC A05/MF A01 CSCL 03A

The brightness temperatures of Jupiter, Saturn, Uranus, and Neptune in the range 35 to 1000 micron. The effective temperatures derived from the measurements, supplemented by shorter wavelength Voyager data for Jupiter and Saturn, are 126.8 + or - 4.5 K, 93.4 + or - 3.3 K, 58.3 + or - 2.0 K, and 60.3 + or - 2.0 K, respectively. The implications of the measurements for bolometric output and for atmospheric structure and composition are discussed. The temperature spectrum of Jupiter shows a strong peak at approx. 350 microns followed by a deep valley at approx. 450 to 500 microns. Spectra derived from model atmospheres qualitatively reproduced these features but do not fit the data closely. Author

N86-15224*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
DETECTION OF [SiII] (34.8 MICRON) EMISSION IN ORION-KL: A MEASUREMENT OF THE SILICON ABUNDANCE IN DENSE INTERSTELLAR GAS
M. R. Haas (Mycol, Inc., Sunnyvale, Calif.), D. J. Hollenbach, and E. F. Erickson Nov. 1985 21 p refs
(NASA-TM-86850; Rept-85433; NAS 1.15:86850; Preprint-Series-43) Avail: NTIS HC A02/MF A01 CSCL 03A

The first detection of the ground state fine structure transition of Si+ at a rest wavelength determined to be 34.815 + or - 0.004 micron are reported. These observations were obtained with the facility spectrometer on NASA's Kuiper Airborne Observatory. A 6' NW-SE strip scan across the Orion-KL region shows [SiII] emission from both the extended photodissociation region surrounding theta 1 Ori C and from the shocked gas NW of BN-KL. The inferred gas-phase silicon elemental abundance relative to hydrogen in the dense 10 to the 5/cc primarily neutral photodissociation region is approximately 2.6 x to the -6, a factor of 0.075 times the solar value and 3.4 times greater than the abundance in the moderate density approx. < 10 to the 3/cc cloud toward zeta Oph. The silicon abundance in the shocked gas is approximately solar, indicating that any pre-existing grains have been destroyed in the shock wave or that the preshock gas carries a near solar abundance of gas phase silicon. The shock-excited [SiII] (34.8 micron) emission may arise from shocked wind material in the outflow around IRc2, with wind velocities approx. > 100 km/s. Author

N86-14475*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

A SIGNAL DETECTION STRATEGY FOR THE SETI ALL SKY SURVEY
J. Solomon, W. Lawton, M. P. Quirk, and E. T. Olsen *In its* The Telecommunications and Data Acquisition Report 15 Nov. 1985 p 191-208 refs (For primary document see N86-14457 05-32)
Avail: NTIS HC A10/MF A01 CSCL 03A

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N86-15225 California Univ., Berkeley.
THE ROLE OF ROTATION IN THE FORMATION OF STARS AND PLANETARY SYSTEMS Ph.D. Thesis
Susan Terebey 1984 119 p
Avail: Univ. Microfilms Order No. DA8513012

Rotation plays an important role in the formation of stars and planetary systems, but detailed calculations of its effects have been limited by the difficulty of following the collapse from interstellar dimensions to those characteristic of the solar system or binary stars. We present here a semi-analytic perturbational solution for the collapse of a slowly rotating cloud core. The initial equilibrium state is exact and corresponds to the uniformly rotating analogue of the singular isothermal sphere. This equilibrium state has a density profile which is proportional to 1/r sq. in its inner regions and attaches smoothly to a uniform background, a plausible approximation for the core of a molecular cloud plus its envelope. Dissert. Abstr.

N86-15226 California Univ., Berkeley.
ON THE ORIGIN OF GALACTIC BULGES, THE EVOLUTION OF GROUPS AND THE DISTRIBUTION OF ABELL CLUSTERS Ph.D. Thesis
Joshua Edward Barnes 1984 171 p
Avail: Univ. Microfilms Order No. DA8512749

A series of investigations into various dynamical topics connected with the origins of galaxies and large-scale structure is presented. Dissert. Abstr.

N86-15227 Texas Univ., Austin.
THE DENSITY AND MOLECULAR COLUMN DENSITY STRUCTURE OF THREE MOLECULAR CLOUD CORES Ph.D. Thesis
Lee George Mundy 1985 217 p
Avail: Univ. Microfilms Order No. DA8513269

Multi-transition studies using CS, C-34S, and H2CO are presented for the dense cores in the molecular clouds M17, S140, and NGC 2024. The typical peak density derived for these cores is -10 to the 6th power/cu cm, much larger than the average density in molecular clouds, but the gas density is not strongly correlated with the line intensities within the core itself. A map of line intensity appears to be a map of molecular column density whereas the gas density is evident in the ratios of intensities of different lines. Although the data do not have the spatial resolution to directly see clumps in the core, statistical equilibrium modeling of the data does provide evidence for an inhomogeneous distribution of the dense gas within the telescope beam. Many aspects of the data can best be exaplained by a model in which the gas with density > 10 to the 5th power/cu cm. is distributed in numerous small (< 1 are minmute) clumps. It is found that the gas densities derived from CS, C-34S, and H2CO are in reasonable agreement and present guidelines for future use of these molecules as density probes. Dissert. Abstr.

N86-15228 Iowa State Univ. of Science and Technology, Ames.
INTERACTING STELLAR WIND MODELS OF ERUPTIVE SYMBIOTIC SYSTEMS Ph.D. Thesis
Terrence Mark Girard 1985 90 p
Avail: Univ. Microfilms Order No. DA8514403

A recently proposed model for the class of stellar objects known as eruptive symbiotic systems, consists of a binary system containing a cool, mass-losing giant and a hot, compact companion which erupts with a wind of its own. The structure and time development of the nebula which forms at the interface of the two stellar winds has been studied with the aid of two different numerical formulations. The first describes the roughly conical portion of the nebulae which reaches a steady state configuration. The second describes the formulation and time development of the entire nebulae, in a less rigorous formulation, which does, however, include the effects of the stars' orbital motion. Both formulations approximate the nebulae as a zero-thickness shell. Results of the steady state formulation are used to relate the shape and internal velocity and mass density distributions within the conical portion of the nebula, to two parameters, m and w, which are the ratio of the mass loss rates and the ratio of the velocities of the two stellar winds. Dissert. Abstr.

N86-15229# Arizona Univ., Tucson.
SPECKLE IMAGE RECONSTRUCTION Final Report, 1 Oct. 1981 - 31 Mar. 1985
P. A. Strittmatter and E. K. Hege 1 Apr. 1985 33 p
(Grant AF-AFOSR-0020-82)
(AD-A158653; AFOSR-85-0635TR) Avail: NTIS HC A03/MF A01 CSCL 03/2

This report contains results obtained from observations using the University of Arizona 2.3 meter telescope, the Kitt Peak National Observatory 4 meter telescope and the multiple mirror telescope. Work Done included: High Resolution Imaging Potential of MMT; Earth Satellite Observations; Asteroid/Planetary Satellite Measurements; and Image Reconstruction Experiments; Scientific Accomplishments pertained to; Asteroid/Planetary Science; Red Supergiants Limb Darkening and Extended Atmosphere; Binary Stars; Active Galactic Nuclei; and QSO Images. Author (GRA)

N86-15230# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
PLASMA WAVES ASSOCIATED WITH THE AMPTE ARTIFICIAL COMET Progress Report
D. A. Gurnett, R. R. Anderson, B. Hausler, G. Haerendel, and O. H. Bauer Jul. 1985 24 p Prepared in cooperation with Aerospace Corp. Los Angeles, and Washington Univ., Seattle
(Contracts N00014-82-K-0183; N00014-76-C-0016; F04701-84-C-0085; N00014-84-K-0160)
(AD-A158727; U-OF-IOWA-85-14) Avail: NTIS HC A02/MF A01 CSCL 04/1

Numerous plasma wave effects were detected by the AMPTE/IRM spacecraft during the artificial comet experiment on December 27, 1984. As the barium ion cloud produced by the injection expanded over the spacecraft, emissions at the electron plasma frequency and ion plasma frequency provided a determination of the local electron density. The electron density in the diamagnetic cavity produced by the ion cloud reached a peak > or approximately 500,000/cc, then decayed smoothly as the cloud expanded, varying approximately as 1/t sq. As the cloud began to move due to interactions with by the solar wind, a region of compressed plasma was encountered on the upstream side of the diamagnetic cavity. The peak electron density in the compression region was about 15000/cc. Later, a very intense (140 mVolt/m) broadband burst of electrostatic noise was encountered on the sunward side of the compression region. This noise has characteristics very similar to noise observed in the Earth's bow shock, and is believed to be a shock-like interaction produced by an ion beam-plasma instability between the nearly stationary barium ions and the streaming solar wind protection. GRA

N86-15231# Lawrence Livermore National Lab., Calif.
OPTICAL PULSATIONS IN AM HER SYSTEMS, REVISION 1
S. H. Langer Jun. 1985 11 p refs Presented at the 9th North American Workshop on Cataclysmic Variables, Seattle, Wash., 24 Jun. 1985
(Contract W-7405-eng-48)
(DE85-017280; UCRL-92823-Rev-1; CONF-8506143-4-Rev-1)
Avail: NTIS HC A02/MF A01

The AM Her systems are widely believed to be mass transfer

binaries containing a white dwarf primary accreting from a red dwarf secondary. The magnetic field of the white dwarf is so strong that it prevents the formation of an accretion disk and funnels the accretion flow into the polar caps of the white dwarf. The accreting matter is decelerated from free fall by passage through a standoff shock located somewhat above the surface of the white dwarf. The hot postshock gas radiates hard X-rays and electron cyclotron emission and cools until it settles onto the photosphere. Middleditch (1982) reported the discovery of a broad feature between 0.4 and 0.8 Hz in the power spectrum of AN UMa and E1405-451. Observations of AM Her and of AN UMa in its faint state did not show similar features. This feature was tentatively identified with the instability discovered by LCS, but it was clear that improved observations and models were both required to confirm the identification. Recent observations by Larsson (1985) confirm the presence of the feature in the power spectrum of E1405-451 and show clearly visible pulsations in the light curves as well as demonstrating that the pulsation is predominantly in red light. As a result it seems worthwhile to present theoretical predictions for optical pulsations. The model of the system is described, emphasizing the general physics of the problem at the expense of details about the numerical aspects. Some of the expected properties of the optical emission are presented, and the observations and model improvements that are of the most immediate interest are suggested. DOE

N86-15232# Rome Univ. (Italy). Dipt. di Fisica.
THE PHYSICAL AND COSMOLOGICAL PREMISES FOR HUMAN EXISTENCE [LE PREMESSE FISICHE E COSMOLOGICHE ALL'ESISTENZA DELL'UOMO]
Giordano Diambrini Palazzi 8 May 1985 11 p In ITALIAN Presented at Conv. Che cosa e il pensiero. L'unita dell'essere, Lincei, Italy, 9-11 May 1984
(Nota-Interna-850) Avail: NTIS HC A02/MF A01

The implication of the Big Bang theory are examined to study the values of physical constants which are compatible with the existence of life. It is shown that the ratio neutrons/protons and the initial helium concentration are related to the existance of life since in slightly different conditions, with only 4% hydrogen no life would be possible. The importance of the ratio between the weak forces and the gravitational forces is also shown.
Author (ESA)

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights. For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N86-15233 Kansas Univ., Lawrence.
VOYAGER 2 ENCOUNTER WITH GANYMEDE'S WAKE: HYDROMAGNETIC AND ELECTRODYNAMIC PROCESSES Ph.D. Thesis
Gul Feroze Tario 1984 193 p
Avail: Univ. Microfilms Order No. DA8513778

Voyager 2's passage through corotation wake region of Ganymede found disturbances in the energetic particle and magnetic field data. To explain the nature of disturbances, an investigation of the interaction of the Jovian plasma with Ganymede is carried out. A series of computer simulations, supported by appropriate theories, are made. Three different aspects of the interaction are studied: (1) A magnetic field model is proposed to describe Alfvenic disturbances caused by Ganymede. Numerical simulations show that the interaction of ensembles of ions with perturbed fields modulates the energies of the ions. The electrodynamic processes associated with the plasma-Ganymede interaction and the plasma expansion into the cavity are simulated using a particle-in-cell method. Using linear MHD theory, conditions for excitation and growth of the Kelvin-Helmholtz instability are investigated. Dissert. Abstr.

N86-15234 Arizona Univ., Tucson.
THE GAS COMPOSITION AND VERTICAL CLOUD STRUCTURE OF JUPITER'S TROPOSPHERE DERIVED FROM FIVE MICRON SPECTROSCOPIC OBSERVATIONS Ph.D. Thesis
Gordon Lee Bjoraker 1985 239 p
Avail: Univ. Microfilms Order No. DA8514901

Spectroscopic observations of Jupiter at 5 microns were analyzed in order to derive the gas composition and vertical cloud structure for the 2 to 6 bar portion of the Jovian troposphere. Two infrared data sets were used. The first one consisted of high spectral resolution observations of Jupiter between -40 and +40 latitude acquired from the Kuiper Airborne Observatory. The second data set consisted of high spatial resolution measurements of Jupiter's belts and zones using the Voyager 1 Infrared Interferometer Spectrometer and Radiometer (IRIS). A spectrum synthesis program was used to calculate the emergent radiance from Jupiter's atmosphere between 1800 and 2250/cm. The temperature-pressure profile and spectroscopic line parameters for seven molecules were specified. Gas mole fractions were adjusted until the calculated spectrum agreed with the observations within error limits. Dissert. Abstr.

N86-15235*# Georgia Inst. of Tech., Atlanta. School of Electrical Engineering.
LABORATORY EVALUATION AND APPLICATION OF MICROWAVE ABSORPTION PROPERTIES UNDER SIMULATED CONDITIONS FOR PLANETARY ATMOSPHERES Annual Status Report, 1 Feb. 1985 - 31 Jan. 1986
Paul G. Steffes [1985] 26 p refs
(Grant NAGw-533)
(NASA-CR-176374; NAS 1.26:176374; SASR-4) Avail: NTIS HC A03/MF A01 CSCL 03B

Radio absorptivity data for planetary atmospheres obtained from spacecraft radio occultation experiments and Earth-based radio astronomical observations can be used to infer abundances of microwave absorbing atmospheric constituents in those atmospheres, as long as reliable information regarding the microwave absorbing properties of potential constituents is available. The use of theoretically-derived microwave absorption properties for such atmospheric constituents, or laboratory measurements of such properties under environmental conditions which are significantly different than those of the planetary atmosphere being studied, often lead to significant misinterpretation of available opacity data. Steffes and Eshleman showed that under environmental conditions corresponding to the middle atmosphere of Venus, the microwave absorption due to atmospheric SO2 was 50 percent greater than that calculated from Van Vleck-Weiskopff theory. Similarly, the opacity from gaseous H2SO4 was found to be a factor of 7 greater than theoretically predicted for conditions of the Venus middle atmosphere. The recognition of the need to make such measurements over a range of temperatures and pressures which correspond to the periapsis altitudes of radio occultation experiments, and over a range of frequencies which correspond to both radio occultation experiments and radio astronomical observations, has led to the development of a facility at Georgia Tech which is capable of making such measurements. G.L.C.

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N86-15236# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
COMMENTS ON FAST PULSES IN MM-WAVE BURSTS
J. E. R. Costa and P. Kaufmann Sep. 1985 9 p refs To be presented at the CESRA Workshop on Radio Continua During Solar Flares, 1985 Submitted for publication

(INPE-3654-PRE/817) Avail: NTIS HC A02/MF A01
The first observation of a solar burst with millisecond time resolution at lambda = 3.3 mm was obtained on 21 May 1984. The time scale of the millimetric pulses durations was of about 60 ms. The possible strong correlation between pulsed emission at 3.3-mm and hard X-rays is discussed. Author

N86-14731# Bundesanstalt fuer Materialpruefung, Berlin (West Germany).
POSSIBILITIES OF SOLAR SIMULATION [MOEGLICHKEITEN DER SONNENSIMULATION]
D. Gundlach *In* Physik.-Tech. Bundesanstalt Solar Elements: Measuring Tech. and Physical Fundamentals Oct. 1984 p 39-48 In GERMAN (For primary document see N86-14728 05-44)
Avail: NTIS HC A13/MF A01

N86-14732# Physikalisch-Technische Bundesanstalt, Brunswick (West Germany).
FUNDAMENTALS OF RADIOMETRY [GRUNDLAGEN DER RADIOMETRIE]
K. D. Stock *In its* Solar Elements: Measuring Tech. and Physical Fundamentals Oct. 1984 p 49-62 refs In GERMAN (For primary document see N86-14728 05-44)
Avail: NTIS HC A13/MF A01

93 SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

N86-15237*# California Inst. of Tech., Pasadena. Space Radiation Lab.
RESEARCH IN PARTICLES AND FIELDS Semiannual Status Report, 1 Apr. - 30 Sep. 1985
E. C. Stone, L. Davis, Jr., R. A. Mewaldt, and T. A. Prince Nov. 1985 17 p refs
(Grant NGR-05-002-160)
(NASA-CR-176361; NAS 1.26:176361) Avail: NTIS HC A02/MF A01 CSCL 03B

Research activities in Cosmic Rays, Gamma Rays, and Astrophysical Plasmas supported under NASA Grant NGR 05-002-160 are discussed. The report is divided into sections which describe the activities, followed by a bibliography. This group's research program is directed toward the investigation of the astrophysical aspects of cosmic rays and gamma rays and of the radiation and electromagnetic field environment of the Earth and other planets. These investigations are carried out by means of energetic particle and photon detector systems flown on spacecraft and balloons. Author

N86-15238# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
STATISTICAL ANALYSIS OF ENERGETIC ELECTRONS (1.2-16 MeV) AT GEOSYNCHRONOUS ORBIT M.S. Thesis
D. I. McCormick Dec. 1984 161 p
(AD-A159295; AD-F250300; AFIT/GSO/ENP-ENS/84D-1) Avail: NTIS HC A08/MF A01 CSCL 03/2

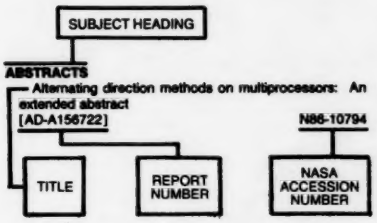
This investigation examined the relationship between energetic electrons (1.2-16 MeV) at geosynchronous orbit and solar wind speed and Interplanetary Magnetic Field (IMF) effects. Electron flux data for a three year period, June 1979 to April 1982, came from DOD spacecraft 1979-053 in geosynchronous orbit. This data was compared statistically with solar wind and IMF data measured by other spacecraft located in the solar wind. Statistical techniques employed included graphical plotting, descriptive statistics, correlation analysis, analysis of variance, and discriminant analysis. Results from this study used daily average values and indicate clear differences in behavior between 1.2 to 6.6 MeV electrons and 6.6 to 16 MeV electrons. Electron flux in the energy ranges of 1.2-1.8 MeV, 3.4-4.9 MeV, and 4.9-6.6 MeV showed generally strong correlation with each other. Electron flux in the energy ranges of 6.6-9.7 MeV and 9.7-16 MeV also showed strong correlation with each other, but not to the three lower energy channels. GRA

99 GENERAL

N86-15239*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
RESEARCH AND TECHNOLOGY Annual Report, 1985
1985 116 p
(NASA-TM-87623; NAS 1.15:87623) Avail: NTIS HC A06/MF A01 CSCL 05A

The role of the Langley Research Center is to engage in the basic and applied research necessary for the advancement of aeronautics and space flight, to generate new and advanced concepts for the accomplishment of related national goals, and to provide research advice, technological support, and assistance to other NASA installations, other government agencies, and industry. This Langley Research Center 1985 Annual Report on Research and Technology contains highlights of major accomplishments and applications made during the past year. The highlights illustrate both the broad range of the research and technology activities at the Langley Research Center and the contributions of this work toward maintaining United States leadership in aeronautics and space research. Author

Typical Subject Index Listing



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A

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[BMFT-FB-W-85-008] N86-14257

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[DE85-012443] N86-14605

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[DE85-017423] N86-15078

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[NASA-CR-172221] N86-14277

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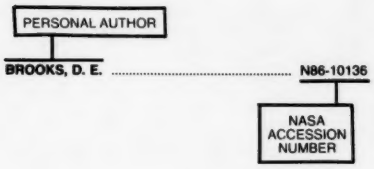

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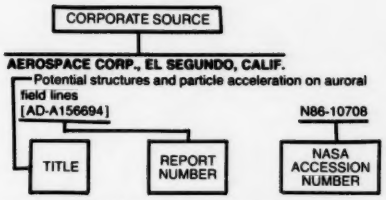

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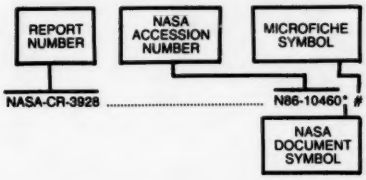

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